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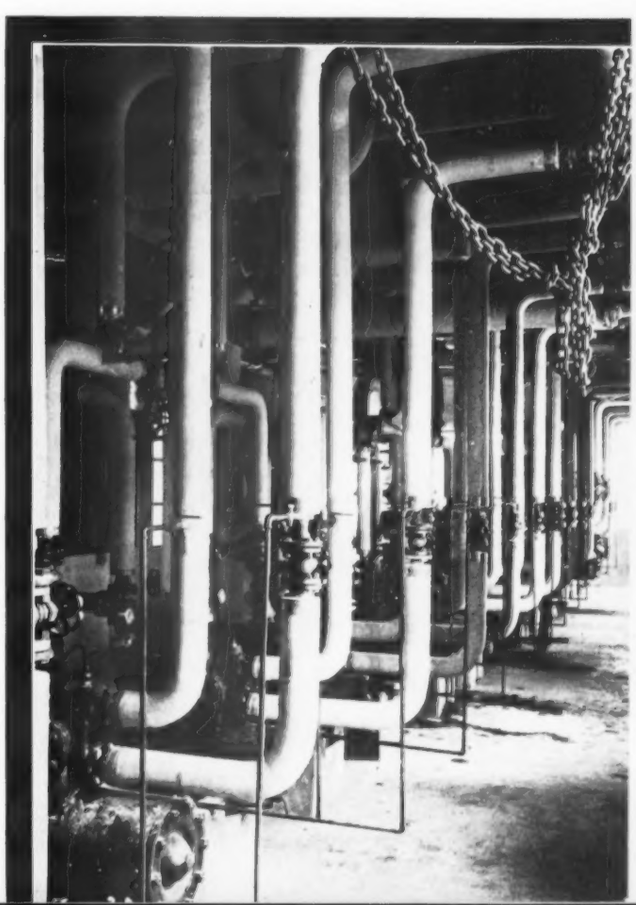
WORLD PETROLEUM

Spain's Petroleum Monopoly—a First Hand Study • Year's Progress in Expanding World's Refining Facilities • Standard Franco Americaine's New Port Jerome Plant • Other Refinery Construction in France • Petroleum Cracking Methods



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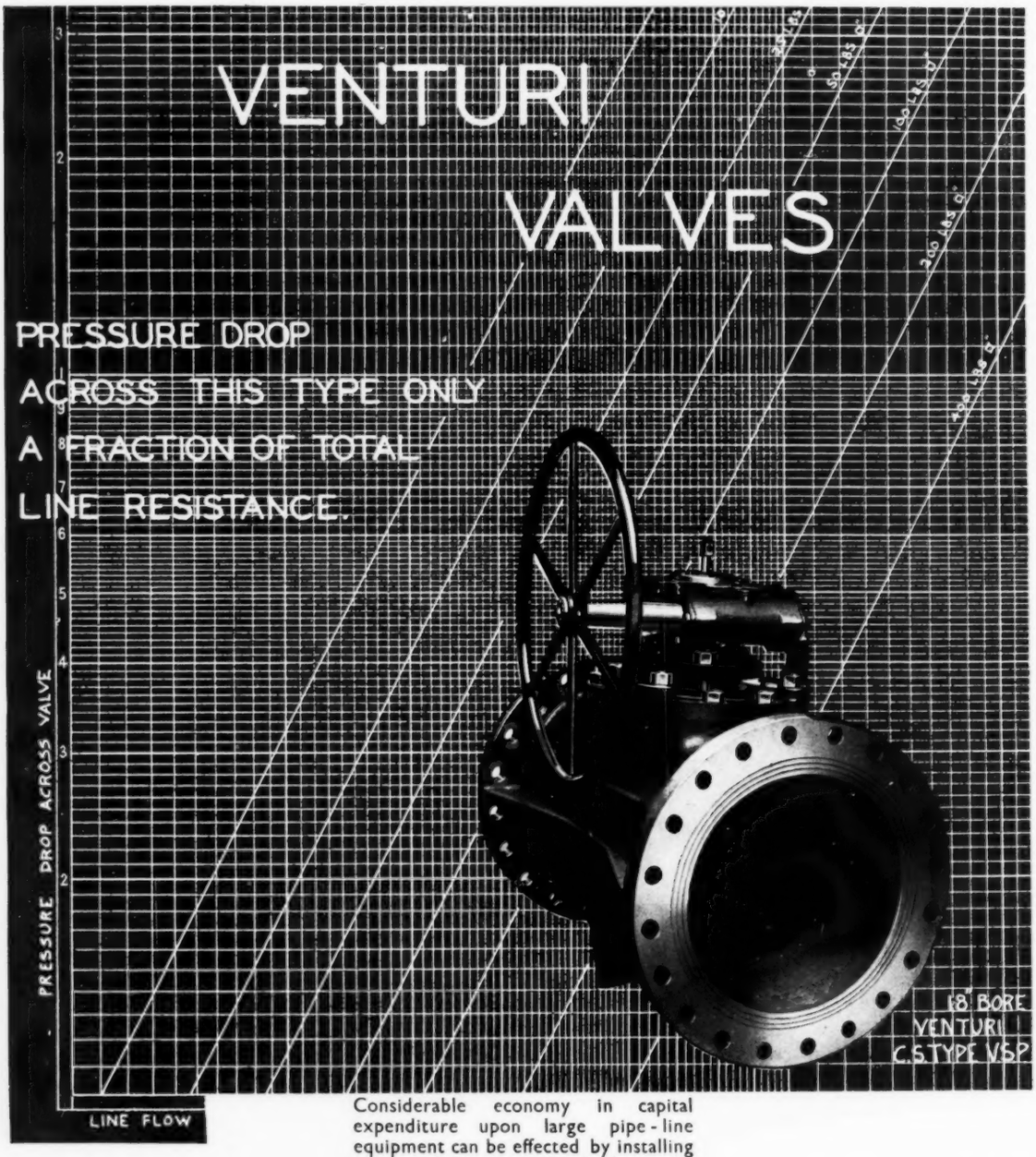

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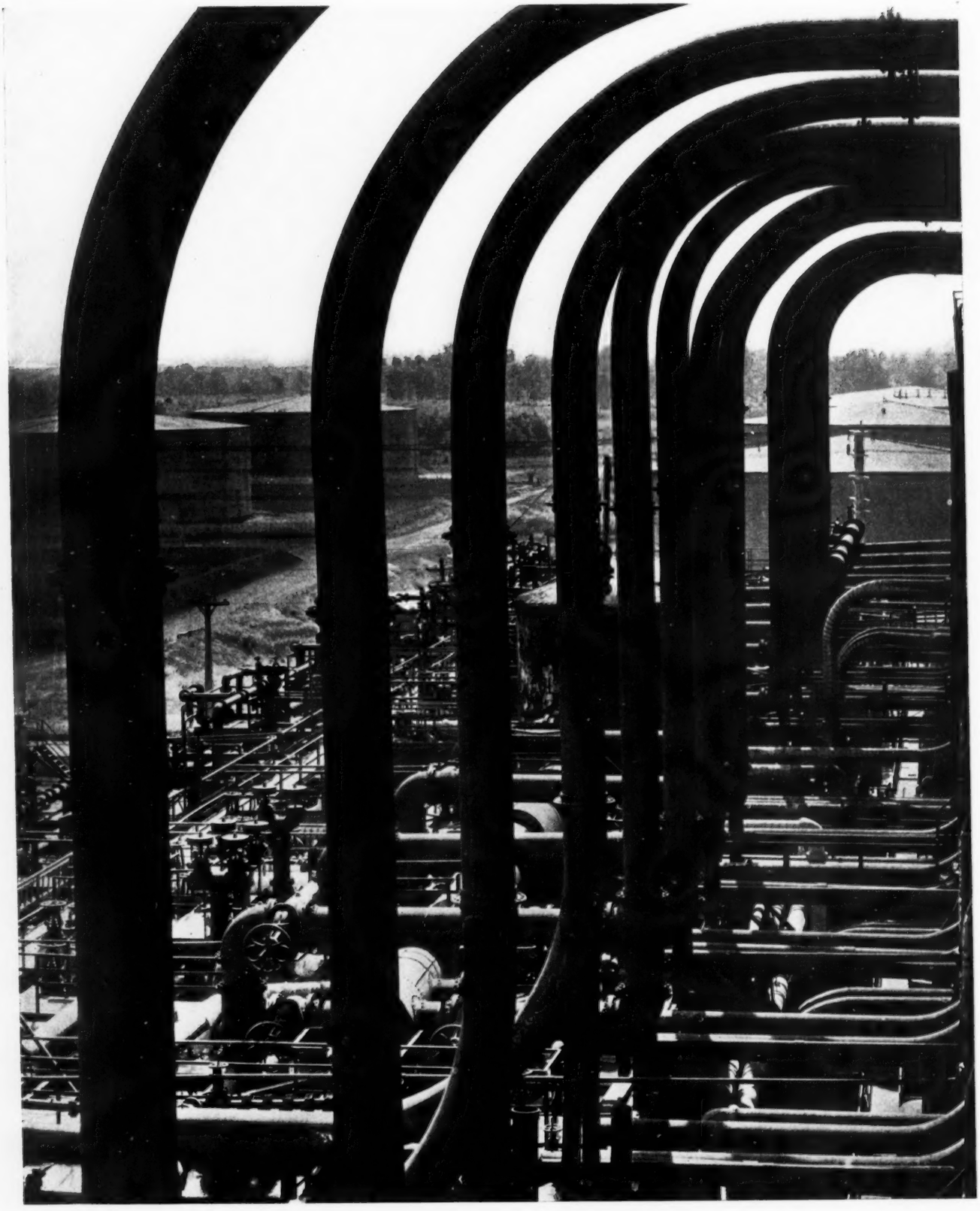

Vapor lines at a Bayway Refinery

Wendell McRae

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PETROLEUM

Progress in Refining

SINCE the outstanding development in the refining industry during the past year has been a great expansion in new construction and a widespread improvement of existing facilities our annual refinery number, presented herewith, is devoted largely to a presentation of the progress made in these particular directions. Special attention is given to France because of the extensive building campaign culminating there which has transformed that country from an importer of petroleum products to an importer of crude for refining within its borders. Whereas formerly seventy-five percent of the requirements of the French market were imported in the form of finished products the same proportion shortly will be manufactured in French plants. Not only has this extensive construction program supplied a market for a great amount of structural material and specialized equipment, but equipment builders in France, profiting by the experience they have gained, are likely to figure more importantly than heretofore as competitors in the international building field.

There is every probability of a continuation of this recent construction activity. A number of countries which in the past have been satisfied to draw their supplies of petroleum products from outside are now planning to provide their own refining facilities so that they may divert to home industry the revenue that results directly and indirectly from that particular activity. The tendency is encouraged likewise by the prospect of an early large increase in crude oil supplies from the Near East with the likelihood of sharp competition in this branch of the industry. Outside of the United States the world's refining capacity is still below the world's needs so that additions to such facilities, if properly located, will continue to justify themselves in view of the probable further decline of American exports.

Progressive improvement in motor car construction, and specifically the development of the high compression engine, has created a demand for high test fuel to which refiners have responded by introducing improved processes and equipment to replace that which was becoming obsolescent. This widespread movement toward modernization is one of the significant tendencies of the time.

It is becoming evident, moreover, that under the scheme of regulation set up in the United States under the national recovery act, whether or not price fixing is adopted and whatever the ratio established between crude and gasoline prices, if these are fixed, the efficient refinery is going to possess a decided operating advantage. As appreciation of this fact spreads it undoubtedly will lead to the reconstruction of many existing plants. With production restricted and marketing competition regulated it is not difficult to foresee that the energies of the industry, for the immediate future, will be concentrated largely on the improvement of refining equipment.

▼

First Month of the Code

SEPTEMBER has been the first month of operation by the petroleum industry of the United States under the code adopted in late August. While the code was officially promulgated to take effect from September 2 the state and sectional quotas established for production did not become operative until September 8. The Planning and Coordination Committee appointed on August 30 has been working zealously throughout the month to set up the necessary machinery for the operation of the code and has suggested certain amendments which have been adopted by order of the President. Subcommittees to deal with questions of production, refining, marketing, accounting, labor, transportation, finance and interpretation of the code have been appointed. Regional committees have been named and the appointment of state committees is to follow.

While these first few weeks have been occupied largely with organization work necessary for the application of the code the period has not been devoid of progress toward the practical results that were its chief objective. Production has been brought measurably near to the total set by the Federal Administrator, advances have been made in the prices of crude and of gasoline and adjustments in hours and wages have been made to meet the requirements of the code. Exercise of the price-fixing power conferred on the President has been wisely deferred pending a clearer view of the trend of developments in the industry.

Altogether the first few weeks of operation under the new governing instrument prepared for the oil industry give encouragement to the hope that it will be applied successfully and place the business on a sound and profitable basis. The best augury for the success of the code is the fine spirit in which it has been accepted by oil men everywhere and the sincere effort they are making to conduct their own operations in harmony with it.

Oil Monopoly in Operation

WHILE proposals for nationalizing the petroleum industry have been advanced from time to time these have been put forward mainly in countries where the trade in petroleum products is so small that such action would not seriously affect the international oil industry. When, however, a nation like France, which consumes nearly 3,500,000 tons of petroleum products yearly and in which a vast organization built up by private enterprise exists for the refining and distribution of such products, gives serious consideration to the establishment of a government petroleum monopoly, the matter assumes a different aspect.

As our readers are aware, from articles previously published, the agitation for a state oil monopoly has been carried on with great activity in France for some time. It does not arise from any dissatisfaction with the service being provided to consumers under private management but has been made a party issue by the socialist parties who have taken advantage of their strategic position in the French Parliament to force action upon it. They have selected petroleum as the primary point of attack with the avowed purpose, as admitted by one of their leading spokesmen, of going on to the nationalization of other industries if successful in bringing this one under state operation. For the French people, therefore, the question presented is much broader than that of dealing with the oil industry and may involve a decision as to whether France is to abandon the dependence upon private initiative under which she has become a great and prosperous nation and enter upon a course which may make her ultimately a completely socialistic state.

The course to be adopted in relation to the petroleum industry assumes an imminent importance because of the action taken by Parliament earlier this year in appointing a commission to examine and report on the subject of a monopoly with a view to definite consideration of the matter at the session which meets this month to deal with the forthcoming budget.

Divorced from its political complications and viewed, as it should be, as a question of practical business, the proposal for a state oil monopoly would be greatly simplified. In handling his private affairs the Frenchman is well known for his conservatism and sound judgment and undoubtedly would apply these qualities in arriving at an opinion regarding the public administration of a business undertaking. The difficulty is that he is not likely to be consulted and to make his opinion felt he must give it expression, which few citizens seem disposed to do.

The business phase of the matter is not wholly ignored, however, even by the political supporters of the idea of monopoly. They repeatedly assert that if the state were to engage in the oil business its revenues from the industry would be greatly increased while it would be possible largely to expand the consumption of alcohol agriculturally produced. If this can be done with no increase in the cost of petroleum products to the consumer and no sacrifice of the service he now receives it is probable that the change would recommend itself to the average citizen.

On these points it is possible to produce instructive evidence from the experience of France's neighbor to the south where a private monopoly, in which the government exercises a controlling hand, has administered the importation, distribution and sale of oil and oil products for the past five years. WORLD PETROLEUM, therefore, is pleased to be able to present in this issue an examination of the operation of the petroleum monopoly in Spain, particularly with reference to the financial return to the public treasury and the quality of service provided to consumers. The writer, Russell Palmer, is familiar with conditions in Spain both before and since the establishment of the monopoly and has spent the greater part of the past year in that country. The article is written to sustain no preconceived notion of the merits or disadvantages of monopoly but is an examination of the subject by a business man who seeks facts on which to base an opinion and a traveler who is conversant with conditions attending motor travel in many countries.

As Mr. Palmer points out the universal growth in demand for petroleum products has greatly increased the gross revenues of the state since the monopoly was set up but the greater part of the apparent increase has been due to the depreciation of the paper peseta. Measured on a gold basis the actual revenue per ton was lower in 1932 than at any previous time during the past decade and was only 60 percent of the amount per ton derived by the French government from taxation. Under private operation Spain undoubtedly would have followed the example of every other government by raising import duties and taxes and would at present be realizing an annual revenue substantially larger than that which actually is obtained from its participation in the business.

On the subject of service and quality of motor fuel dispensed Mr. Palmer confirms opinions expressed by thousands of motorists who have traveled in Spain and who in frequent instances have found difficulty in operating modern high compression motors on the fuel obtainable. While the monopoly maintains a few very attractive stations in some of the larger cities the modern service station familiar to motorists in America, France and England is very seldom to be found in the villages and rural districts of Spain.

In the case of France the difficulty of taking over the petroleum industry would be much greater than in Spain because of the vastly larger investment involved, an investment by the way on which the private companies have been able to earn an average of only 2.75 percent in the past few years. Moreover, France has encouraged a great development of refining facilities on the virtual pledge of favorable terms ot the operating companies for a period of twenty years at least. Aside from these special considerations, however, there is nothing in the operation, under particularly favorable conditions, of the monopoly in Spain to encourage France or any other highly motorized country to take a similar step. As Mr. Palmer says, all the financial results that any government can hope to obtain through a petroleum monopoly can be secured, without a penny of investment, by intelligent regulation and taxation and without throwing open the doors to waste and inefficiency.

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Packaged Lubes Gain Acceptance

PACKAGING of lubricating oils, which we have consistently advocated as a means of preventing substitution and enabling owners of trade-marked brands to get more direct benefit from the advertising of their products, may be said definitely to have arrived. A number of American oil companies, after extended tests with tamper-proof packages under actual sales conditions, have decided to adopt such packages for all their lubes. Others are still experimenting in the effort to find the economically perfect container. Consumer response has fully justified the adoption of packaging and where the habit is formed, customers refuse to buy unpackaged lube oil. In England where trade sentiment toward packaging at first was decidedly lukewarm the great success of one of the large companies in marketing a new brand of lubricating oil in glass bottles has put a different face on the matter and has set other companies to studying the subject. In the particular case referred to a very great increase in sales resulted from the offering of the new package and while this may have been due in part to the excellence of the oil itself and to energetic advertising the oil company executives agree that a large share of credit is due the bottle.

The Mirage of the Monopolists

Spain's Monopolistic Control of Petroleum Affords No Sound Encouragement to Other Countries to Adopt Similar Course.

By Russell Palmer

THIS is a critical age. Despite its remarkable growth and the perfection of its facilities, the petroleum industry, in common with many other institutions, has come in for a great deal of criticism. Most of this has originated with those who are happily free from the industry's greatest responsibilities. It is not surprising to find in the ranks of those who feel certain of being able to improve the conduct of the business, important political groups in certain of the world's governments, composed entirely of men who have no practical knowledge of the subject.

It is generally admitted today, except among the extreme advocates of state socialism, that private business is usually conducted with greater dispatch, more economy and wider satisfaction to the community. In our complex modern life the lines of industry and government undoubtedly tend to converge, but there is no question whatever that the trend of the world today is toward state supervision but away from state participation in industrial activity.

Why then is it that the suggestion is being seriously advanced in certain countries, notably France and Japan, that the government should take over and carry on the national petroleum industry? Whence comes this pressure? I suggest that two large and influential groups of public men furnish the driving force. First are those who sincerely believe that this is a practical, important means of adding to the state's revenue and so assisting in meeting accumulating budgetary deficits. The second group of advocates is not so easily identified because it travels discreetly under the banner of the first group. It is composed of that myriad of professional politicians who regard this great industry as a marvelous field for political spoliation.

The petroleum industry looms large in the eyes of governments. It is in the unhappy position of being the world's biggest and best tax gatherer. In fact it reminds one of nothing so much as the fishing cormorant of Japan, whose owner turns it loose to seek fish in shallow waters, first carefully placing a close-fitting brass ring about the poor creature's neck to make sure that none of the harvest may be swallowed. The proportion which the industry is permitted to retain from its gross takings is so small compared to the amount which it is compelled to pass on to governments that it might well adopt the brass-ringed cormorant as its emblem.

IT HAS been proposed in France and Japan that the petroleum industry should be taken over and operated by the government. Ardent advocates of this plan claim many advantages for it. Are they justified? The best guide to the working of petroleum monopolies in practice is the study of an existing specimen. The only important example is in Spain where over 700,000 tons of oil products are sold annually by the Compañia Arrendataria del Monopolio de Petrolios S.A., which enjoys the exclusive right to import and sell liquid fuel, does so free of duty and profits tax and shares its earnings with the government. The writer has an extensive first hand knowledge of Spain both before and since the creation of the monopoly and bases his views on personal observation.

Petroleum products are so essential to modern life and the industry is so widespread that the world's governments have been quick to utilize the splendid machinery of this industry to gather the heaviest commodity taxes levied anywhere. Ironically enough this important office of Chief Tax Collector is without salary or other emolument. There is nothing to compensate for the fact that it leads inevitably to a certain amount of unpopularity. It is difficult for the public to grasp the fact that the oil companies are only the instrument of collection.

Many governments are now confronted with acute fiscal problems. The general decline in industrial and commercial activity has sharply curtailed the yield from ordinary forms of taxation, leading to substantial deficits. Private business meets this problem by retrenchment, but few politicians have the courage to grasp this nettle and prefer to cast about for new ways to bolster the public revenue. Since the petroleum industry has proved such a wonderful tax producer it naturally occurs to these statesmen that it might be a splendid thing to use the power of the state to take over the industry entirely. If the petroleum industrialists can bring in this great annual tax harvest and still earn a modest return on invested capital, surely this industry must be a veritable gold mine—too good a thing for the state to leave in private hands. So runs the reasoning of the political mind. It is accompanied by a certain private satisfaction at this tremendous prospective enlargement of the pastures upon which the politician browses.

Certainly on the surface there are some tempting arguments in favor of a petroleum monopoly. Petroleum may seem an ideal substance on which to found a state monopoly. Unlike matches, tobacco and spirits it is not easily smuggled. The monopoly will be absolute. There is no practical substitute. If wheels are to turn, oil and its products must be used. The public need for the product is indispensable and certain to expand. The substitution of a single organization for a number of private companies should

certainly permit remarkable savings on the face of it. For example, all advertising expenditure can be eliminated. Then too there are certain vague ends of national defense to be served. Of course it is true that the "sea of oil on which the allies floated to victory" in the world war was a private and remarkably efficient one, but that point is disregarded.

Before accepting these claims it might be a wise precaution to find out how a petroleum monopoly actually operates in practice. In Spain we have a notable and easily accessible example. Here the transition was made under the most favorable conditions. The business was already in an excellent state of development. Spain's prosperity, the product of her neutrality during the world war, made it easy to secure the funds needed to buy out private interests. A dictator existed to force the change without any regard whatever to public opinion and a special form of monopoly was adopted designed to combine the advantages of government control and private initiative. Since its creation the Spanish monopoly has enjoyed the advantage of very cheap raw material and a substantial expansion in consumption. What has happened? Has the monopoly been a boon to the government and how fares the consumer, that poor devil who ultimately pays the bill?

In France steps already have been taken to secure some information about the Spanish monopoly. A very excellent report was rendered to the Mines Committee of the French Chamber of Deputies by Deputy Charles Baron. Certain of M. Baron's valuable statistical compilations are published in connection with this article. They are worthy of careful analysis and an effort will be made to deal with them here. M. Baron's report naturally deals with the subject primarily from the standpoint of revenue to the state. It is suggested that there are a number of factors worthy of equal consideration—factors of vital importance to the public at large.

Product of Dictatorship

THE petroleum monopoly in Spain was not due to the pressure of public opinion but was a product of the military dictatorship under General Primo de Rivera (Marquis of Estella). For many years prior to this practically the whole of the petroleum trade was in the hands of American, British and French interests. The business had been opened up and developed by the enterprise of these companies at a time when the country was in an extremely primitive condition as to communications and was being carried on in a manner satisfactory to the consuming public.

The first interference with the existing situation began as a result of Russian efforts to force a way into the market. The most important of the Spanish petroleum companies was the Petroleos Portopi S.A. which, in 1925, made arrangements with the "Transmediterranea" shipping company for the importation of Russian petroleum products into Spain. This group was in close connection with the political party then exercising power through the military directory and strong pressure was brought to bear on the government to assist in this scheme and further discrimination in favor of Russian products.

To appreciate the situation which existed it must be remembered that Spain was then in an excellent financial condition. A great amount of capital had taken refuge in Spain and the country had enjoyed a period of remarkable material prosperity during and following the war. There had been a great accumulation of funds in the banks which were unable to find suitable employment for their reserves. The banks supported the action referred to above and at the same time recommended the establishment of a petroleum monopoly. The situation in Spain at the time and the financial position of some of the leaders of the country led to a ready acceptance of the bankers' proposal.

Furthermore, the petroleum monopoly scheme was in line with Primo de Rivera's declared policy of freeing Spain from the interference of foreign capital and it may have been sincerely expected that a monopoly would provide a larger revenue than the existing customs duty. A customs dispute arising with one of the large importing companies over a question of classification was given extensive publicity in such a way as to suggest that the importers were imposing on the government, the object being to inflame public opinion against the private companies.

Gen. Primo de Rivera, Spanish dictator who established the monopoly.

A few days before the publication of the decree by virtue of which the monopoly was established Primo de Rivera issued a semi-official note announcing his decision and explaining the reasons for it. The note stated that within the coming five years the Spanish Government would derive an annual revenue of 200,000,000 pesetas from the monopoly, that the sales prices of petroleum products would decline, and that the monopoly would constitute in the future a considerable outlet for industrial alcohol. The manner in which these predictions were realized will be discussed later.

Terms of Monopoly

THE MAIN provisions of the decree of June 28, 1927 were as follows:

The share of the Spanish government in the monopoly's profits was to consist of the dividends of the paid up stock reserved for the State, and of a certain percentage of the profits when they exceeded 10 percent of the capital invested by the grantee company.

In view of the appointment of the grantee, the fact of having offered to pay the government a premium would be taken into consideration.

The contract would be made for a period of twenty years, the Spanish government reserving the right to denounce the contract at any time without having to disclose the reasons therefor.

The government was to have a representative on the board of the grantee company.

Any merchandise imported by the grantee company was to be exempted from the payment of customs duties, and the company also was exempted from the tax on profits.

The field of activity assigned to the company included: importation and sale of petroleum and petroleum derivatives; oil research in Spain; development of the coal, shale and lignite distillation industry; constitution of emergency stocks; acquisition of oil fields abroad; building of refineries and of a tanker fleet.

The government was to have a voice in all the activities of the grantee company including the appointments of the personnel and the fixing of purchase prices; expenditures exceeding 50,000 pesetas must be approved of by the Minister of Finance.

The company-capital, board of directors and managers must be exclusively Spanish; however, the personnel receiving a salary of less than 10,000 pesetas a year could include foreign citizens in a proportion not exceeding 10 percent.

This was followed by the decree of October 20, 1927:

In virtue of this decree, the grant of the monopoly was given to a consortium formed by the following banks: Banco Urquijo, Banco de Bilbao, Banco Hispano-Americano, Banco Herrero, Banco de Vizcaya, Banco Español de Credito, Banco de Cataluña, Banco Hispano-Colonial, and Banco Marsans.

In addition to the clauses contained in the decree of June 28, 1927 the Consortium was to comply with the following provisions: During a period of six years 60 percent of the stock issued could not be transferred; the capital was to be increased by 75,000,000 pesetas within the following ten years; the contract might be cancelled if, by January 1, 1928, the monopoly had not actually started full operation.

The actual contract between the Spanish Government and the grantee company, the Compañia Arrendataria del Monopolio de Petrolios S.A., or C.A.M.P.S.A., was signed on January 10, 1928. It contains the following provisions:

The C.A.M.P.S.A. is charged with the importation, handling, storage, distribution and sale of all liquid mineral fuels and their derivatives.

The contract is made for a period of twenty years starting January 1, 1928.

The capital is fixed at 195,000,000 pesetas. Of the 390,000 shares of capital stock of a nominal value of 500 pesetas, 90,000 entirely paid up shares will be turned over to the Spanish Government (A shares) and the other 300,000 registered shares (B shares) can only be owned by Spanish individuals or companies.

Only Spanish citizens can be members of the board.

A representative of the government will attend all meetings, control the accounts and his agreement will be necessary for all expenses below 50,000 pesetas. Expenses above 50,000 pesetas must be authorized by the Minister of Finance.

The C.A.M.P.S.A. must constitute stocks equal to four months' consumption, set up within five years a tanker fleet adequate to the monopoly's needs, establish a refining industry with a productive capacity equal to 80 percent of the country's consumption and conduct oil researches in Spain.

The directors and staff and 90 percent of the employees receiving a salary under 10,000 pesetas must be Spanish. Appointments of members of the staff must be approved by the Minister of Finance.

Sales prices are fixed by the grantee company with the agreement of the government.

The C.A.M.P.S.A. receives a premium amounting to 4 percent of the net profit of the company. When the profits exceed 8 percent of the capital, the surplus will be divided as follows:

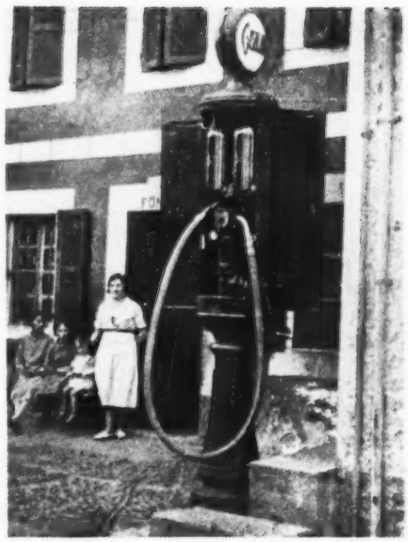
25 percent for the Government and 75 percent for C.A.M.P.S.A. when the profits range from 8 to 10 percent of the capital.

50 percent for the Government and 50 percent for C.A.M.P.S.A. when the profits exceed 10 percent of the capital.

The Council of Ministers may denounce the contract without disclosing the reasons therefor.

Financial Results to State

SINCE the advocates of monopoly base their arguments primarily upon the financial advantages accruing to the state from this system, the financial side of the Spanish monopoly's operations merits the most careful examination. Primo de Rivera's prediction that within five years the government would be receiving 200,000,000 pesetas a year from the monopoly was, in fact, realized in 1931 when the state revenue, in *paper* pesetas, exceeded that figure, the gold equivalent being a little over 100,000,000 pesetas.



Typical Spanish roadside pump. There are few service stations.

Setting aside for the moment the fact that the inflation of the paper peseta alone made it possible to attain this figure, let us consider to what extent the increased return was the product of an expansion in consumption. In 1927, the year in which the Dictator's prediction was made, there was imported into Spain 356,655 tons of petroleum products. So rapid was the increase in consumption that imports more than doubled within four years, reaching in 1931 the figure of 787,458 tons. Is there anyone familiar with conditions in Spain who will seriously contend that any part of this increase was due to superior facilities provided by the monopoly or to its initiative in developing the market? As a matter of fact the facilities of the monopoly in 1931 and today are measurably inferior to those maintained by the private companies as long ago as 1926. Being without the stimulus of competition the monopoly has not hesitated to restrict its retail outlets to the minimum, in order to keep down overhead.

Not only has there been no increase in the number of pumps since C.A.M.P.S.A. took over the distribution of gasoline throughout the country, but the number is less than under the former régime of free competition. The remaining pumps, which belong to C.A.M.P.S.A. are operated on a percentage basis by duly appointed individuals. The percentage to which they are entitled decreases as the quantities sold increase, so that once a certain level has been reached, they have no great interest in expanding sales. The average discount received by retailers, before the monopoly was established, amounted to 7½ centimos per liter.

Retailer's Schedule of Commissions

	Centimos
up to 5,000 liters	3½
from 5,000 to 10,000 liters	3
from 10,000 to 20,000 liters	2
20,000 liters and above	1

Sales Stimulus Lacking

AS THESE rates apply to the total quantities sold, a retailer selling 10,000 liters has more profit than if he had sold 11,000, the sale of 10,000 liters meaning a profit of (10,000 × 3) 30,000 centimos, whereas the sale of 11,000 liters (11,000 × 2) means a profit of 22,000 centimos. The C.A.M.P.S.A.'s policy in this regard undoubtedly slows down the expansion of sales. Furthermore, no credit facilities are allowed to retailers, cash payments being required at the time orders are filed to the monopoly's district offices.

Pumps located in garages had to be purchased from the C.A.M.P.S.A. and cash paid. In small towns and villages where the volume of sales of gasoline was not sufficient to warrant the purchase of the pumps, many garage-owners reverted to the old method of sale in cans. The inadequate number of retail stations, their indifferent location and inferior equipment are notorious among motor vehicle operators in Spain.

It is universal practice among private oil companies to bend every effort to stimulate the consumption of gasoline. Touring is encouraged, motorists are given every possible assistance in the planning and completion of tours, free maps and literature are distributed at practically all service stations and a great deal of service is provided for which no charge is made. Research work uncovers new uses for petroleum and its derivatives and these are brought to the attention of the public by means of widespread advertising. C.A.M.P.S.A.'s efforts in this direction have been insignificant. There is in fact no selling whatever in the ordinary sense of the word. The commodity is simply made available at the fewest possible number of points for delivery to consumers on demand.

The increase in consumption was handed to the monopoly on a platter in spite of its indifference and is solely the result of the more widespread use of motor cars following upon the great improvement of the highways throughout Spain, plus the general trend towards more motor transport, which Spain has enjoyed in common with all other countries. Spain's splendid modern system of highways has led to the development of an

intensive network of bus lines which have greatly increased the demand for gasoline.

To return to the question of the financial advantages which the government has derived from the monopoly: We give the figures in both gold and paper pesetas in Table I (based on Annexe 1 of the Baron Report). It is to the gold figures that the principal weight must be given. The commodity originates outside the country (as would be the case in France) and must be paid for in terms of gold exchange. The shrinkage in the paper peseta following the abandonment of the free export of gold makes the paper peseta figures wholly unreliable as an international guide. Table I gives a comparison of the returns to the state year by year for the past ten years. In contrasting the results obtained by the monopoly with the former system of import duties it should be borne in mind that Spanish customs duties are in any event payable in gold. Consideration should also be given to the fact that the returns to the state do not include taxation, which though paid by the private companies is not demanded from the monopoly. This formerly averaged 20,000,000 pesetas annually.

Revenue Per Ton Decreased

IT WILL be noted that the 356,655 tons of petroleum products imported in 1927 yielded the government Pesetas gold 48,424,690 or Pesetas gold 135.70 per ton. By 1931 the volume of imports under the monopoly for reasons already set forth reached a total of 787,458 tons. The government's return from the monopoly in lieu of its former import duty amounted to Pesetas gold 105,723,890, the return per ton showing a slight decline to 134.20 per ton. By 1932 it had fallen to P.g. 120.50 per ton. This is scarcely a spectacular achievement for the monopoly.

The Spanish Government's revenue increased from 48,424,690 gold pesetas in 1927 (year preceding the establishment of the monopoly) to 94,051,377 in 1932, the percentage of increase being 94 percent. During the same period the tonnage sold increased from 356,655 to 780,275, the percentage of increase being 119 percent.

The form of comparison between the monopoly and the former arrangement which the ardent monopolists point to with the greatest pride is that shown in Table II (Annexe 7 of the Baron Report) wherein the receipts of the state from the monopoly are contrasted with what would have been collected under the customs schedule from which the monopoly is exempt. All the figures are in paper pesetas (for the same data on a gold basis see Table III). On the surface they show a substantial advantage to the state, though it will be noted that the apparently favorable difference to the state has been steadily declining. It fell from Pesetas paper 113.30 per ton in 1928 to P.p. 66.80 in 1932; in fact the alleged gain to the state was slightly less in 1932 on a volume of 780,275 tons than it was in 1928 when 460,505 tons were imported.

What are the facts about this purported advantage? Was it in any sense due to the state's partnership with the monopoly? Not at all. The old customs duty was on an ad valorem basis. The unprecedented decline in oil prices throughout the world during this period resulted in imports being invoiced at a figure much below that of those prior to 1928. Since the monopoly had the sole right of importation and since its imports were duty free, there was of course no change in the old rate of duty to meet this decline in basic prices although the period was one of increasing tariffs throughout the world. Can anyone seriously contend that if the old system had been allowed to stand that the Spanish government would have done what its neighbors did not, viz., allowed the old rate to stand? There is not the slightest basis for such an assumption.

It is most important to observe what actually took place about this time in France where no monopoly existed. Between the end of December 1927 and June 1933 customs duties and taxes in France were increased from Frs. 0.771 per liter to Fr. 1.00, nearly 30 percent. A similar increase in Spain, which would have been inevitable had general importation by private companies been permitted, would have raised the theoretical customs yield from paper pesetas 178,710,207.25 to 232,019,461.75 or 20,653,705 paper pesetas more than the return from the monopoly arrangement. On a gold basis the figures are even more impressive.

That the system which prevails in France is unquestionably more advantageous to the state than its neighbor's monopoly plan is clearly illustrated by the following figures:

Tonnage of petroleum products sold in Spain in 1932	*701,327 tons*
Net receipts of the Spanish Government in 1932, converted into French francs on the basis of the average rate of exchange	461,522,000 frs.
Net profits of the Spanish Government per ton consumed	658 frs.
Tonnage of petroleum products sold in France in 1932	*3,430,908 tons*
Net receipt of the French Government (customs, duties, taxes and surtaxes on petroleum products, taxes on profits and other taxes paid by companies)	3,437,377,749 frs.
Net profit of the French Government per ton consumed	1,000.88 frs.

TABLE I

Comparative receipts of the Spanish Government before and after establishment of the monopoly

In the first period the receipts are represented by the import duty paid; for the second period they are composed of the products of the exploitation by the monopoly and the dividends on the free shares held by the state.

Years	Tons imported	Receipts in Paper Pesetas Total	Receipts in Paper Pesetas Per ton	Receipts in Gold Pesetas Total	Receipts in Gold Pesetas Per ton
1922	135,610	25,340,689	186.75	20,195,003	148.9
1923	154,230	34,634,712	224.50	26,350,207	170.8
1924	217,215	48,165,273	221.75	32,841,452	151.2
1925	245,887	44,348,279	180.30	32,891,997	133.7
1926	272,475	51,105,444	187.50	39,167,263	143.7
1927	356,655	55,078,242	123.75	48,424,690	135.7
1928	460,505	112,190,359	243.60	96,549,363	209.6
1929	520,484	148,847,306	286	113,623,897	218.3
1930	656,345	174,369,354	265.70	106,778,539	162.7
1931	787,458	213,752,560	271.35	105,723,890	134.2
1932	780,275	225,864,382	289.40	94,051,377	120.5

Annexe 1, Baron report.

TABLE II

Receipts of the Spanish Government from the monopoly compared with the customs duties which would have been collected under the old plan

	Paper Pesetas				
	1928	1929	1930	1931	1932
Duty otherwise applicable to the products imported by the monopoly	60,272,195.15	88,829,018.77	124,264,928.31	150,819,882.58	173,710,207.25
Receipts of the State from the monopoly (dividends etc.)	112,462,554.53	148,847,306.31	174,369,354.53	213,752,560.58	225,864,382.11
Difference in favor of the State	52,190,359.38	60,018,287.54	50,104,426.22	62,932,678.00	52,154,174.86
Difference per ton imported	113.30	115.30	76.30	80.00	66.80

Annexe 7, Baron report.

The close supervision which the government exercises over the affairs of C.A.M.-P.S.A. may suggest the question whether its unfavorable showing is due in any degree to the more liberal policy which the state might be expected to pursue toward its employees. What has actually happened to the salaries paid the personnel is interesting. When C.A.M.P.S.A. was established and took over the staffs of the private companies, the highest salaries were reduced, the average salaries were maintained, and the lowest salaries were somewhat increased. Since then, a slight reduction has been applied, but it was easily accepted by the personnel, the latter being now entitled to old age pensions.

So far in this article great stress has been laid upon the financial side of the Spanish monopoly simply because the monopolists take their stand primarily upon the supposed benefits of their plan to the public treasury. It is quite clear that in practice the Spanish monopoly yields no financial advantage to the fisc as compared with private business and that France derives a greater pro rata return from her present system than the Spanish Republic does from its monopoly.

Public Service Inadequate

THE true measure of government success in the sphere of business is not, of course, the amount of profit extracted from the public but the advantage brought to the citizen in the form of lower prices, a better product or improved service. Can the state, operating through a monopoly, sell a commodity of the present quality for less money? Can it improve the quality of the present article without increasing the prices? Or can it render a service superior to private business?

It is precisely in this sphere that the Spanish monopoly has registered complete failure.

To consider the item of price first: Table IV (Annexe 4, Baron Report), shows the sales prices of gasoline in Spain both before and since the establishment of the monopoly. The present prices are lower than those existing during the era of private business. This is due entirely to the overproduction of oil throughout the world which has led to a decline in prices everywhere.

TABLE III

Receipts of the Spanish Government from the monopoly compared with the customs duties which would have been collected under the old plan

	Gold Pesetas				
	1928	1929	1930	1931	1932
Receipts from the monopoly	96,549,363	113,623,897	106,778,539	105,723,890	94,051,377
Customs duty at the premonopoly rate	51,869,359	67,808,411	76,096,098	74,595,360	72,332,870
Difference in favor of the state	44,680,004	45,818,486	30,682,441	31,128,530	21,718,507
Difference per ton imported	99	88	46.70	39.50	27.80

Annexe 6, Baron report.

During the period from December 1927 to June 1933 imported gasoline prices dropped from 8½ cents to 3¾ cents, a decline of 60 percent.

During the same period, gasoline prices in Spain declined from gold pesetas 0.481 to 0.274 per liter or 43 percent.

In France, from the end of December 1927 to June 1933 gasoline sales prices declined from Frs. 2.10 to 1.55 or 26 percent although customs duties and taxes, during the same time, increased from Frs. 0.771 per liter to 1.00 or 30 percent.

TABLE IV

Gasoline prices in Spain

	Before the monopoly			After the monopoly				
	1925	1926	1927	1928	1929	1930	1931	1932
Selling price to the public, per litre:								
Gold Pesetas	0.451	0.468	0.455	0.481	0.448	0.313	0.293	0.274
Paper Pesetas	0.616	0.592	0.52	0.56	0.587	0.61	0.593	0.66 [1]

[1] The price of 0.66 does not include the provisional tax of 0.10 per liter established March 17, 1932.

Annexe 4, Baron report.

Prices have been the same in all parts of Spain since November 1931. Prior to that date, the country was divided into four zones, and prices varied according to zones. Prices have been made uniform by applying to important consumption centers the same prices as applied before to remote villages.

Prices remained unchanged since April 1, 1932 at pesetas 0.76 including a municipal tax of 10 centimos per liter. These prices were, a short time ago, higher than the French prices. They are now about the same but consideration is due to the fact that retail prices of *all* other products are lower in Spain than in France. The costs of distribution are of course materially less in Spain than in France, owing to the prevailing lower scale of wages and the extremely low margin of compensation which the monopoly is able to force on its retail agents in the absence of competition.

Quality of the Product

THE gasoline sold in Spain is inferior in quality to that sold in the country prior to the establishment of the monopoly and is distinctly inferior to that sold in France under the denomination of "essence tourisme." Much of it in fact is totally unsuited for use in modern motors of the high compression type. The absence of the spur of competition completely removes all incentive to strive for a better product. The tendency of a monopoly is consequently to buy in the lowest market regardless of indifferent quality. The Spanish monopoly makes extensive purchases in Russia, where a great deal of gasoline is produced from antiquated refinery equipment incapable of turning out a fuel adapted to modern automobile engines.

The matter of the monopoly's purchases has been ventilated from time to time in the Cortes and the charge made that bribery and corruption have been factors in influencing the placing of contracts. This may or may not be true but any motorist who has driven a modern automobile in Spain knows to his sorrow that the gasoline is far from uniform and much of it is considerably below the standards maintained in other modern countries. It has a low knock rating and deposits carbon with a rapidity which necessitates removal every thousand miles or so if the car is to function at all. This of course adds considerably to the cost of operation and is a particular disadvantage in a mountainous country like Spain.

Because the oil business is in the hands of a monopoly the Spanish motorist does not participate in the fruits of progress enjoyed by motorists in other lands. Nothing has been done so far by the C.A.M.P.S.A. towards the introduction of Ethyl fluid. The car owner who wants a high grade modern fuel and is willing to pay for it must drive to Gibraltar or France. He cannot buy it at home for super-carburants with a high anti-knock rating are unavailable in Spain.

The Spanish people have a natural predilection for automobiles. The topography of the country is such that a very circuitous route is often necessary to connect one important center with another by rail. The new well-surfaced roads, however, offer quick and easy intercommunication, and the number of automobiles in use tends to increase as rapidly as the economic conditions of the country

permit. The most difficult obstacle confronting the vendors of automobiles in Spain is that of adapting the modern type of motor cars to the pre-war type of fuel sold so widely. Cars are frequently brought in for service by new owners who are under the impression that something is wrong mechanically, when as a matter of fact the knocking complained of is simply due to the low knock point of the only gasoline available.

Having considered the items of price and quality, service remains to be dealt with and it is to be regretted that there is so little of a praiseworthy nature to be listed. C.A.M.P.S.A. has a few, a very few, modern service stations in the nature of show places in some of the larger cities. The average Spanish service station is a small red pump and the service equipment consists of a battered water can. The dispensing equipment is certainly the most primitive in western Europe, slow, laborious and hand-operated. Power air pumps are almost unknown. Woe to the poor motorist with a flat tire and no pump of his own. He must rattle on his rims from village to village tracing down the report that Pepe, who operates the camion in the next pueblo, has a hand pump. Not only do the "service stations" render no service but they are few and far between and there are no signs to guide the motorist to one. This is the condition which exists in a country of 20,000,000 people and nearly 200,000 automobiles!

Promise and Performance

So many claims are now being made for the monopolistic principle in France that it may be well to contrast briefly the promises made at the time when the Spanish monopoly was promulgated with performance since.

It was promised that within five years the Spanish government would be getting 200,000,000 pesetas a year from the monopoly, sales prices of petroleum products would decline and the monopoly would constitute in the future a considerable outlet for industrial alcohol. The monopoly was to carry on oil research in Spain, develop the coal, shale and lignite distillation industry, acquire oil-fields abroad, build refineries and a tanker fleet.

Actually the income of the government recently has exceeded the 200,000,000, due solely to the decline in value of the peseta and the increase in consumption, the gold return being less than half that amount. Sales prices have declined 43 percent while the cost of the product has declined 60 percent (gold basis). On the internal or paper peseta basis prices are higher now than when the monopoly was established.

Although one of the objects of the monopoly, when it was established, was to create an outlet for industrial alcohol, no headway seems to have been made in this respect and, according to our information, no mixture of gasoline and alcohol is being offered for sale by C.A.M.P.S.A. at the present time. It is understood that the law in Spain requires the taking of alcohol to an amount of 4 percent of the gasoline sold. If C.A.M.P.S.A. has been able to avoid the actual admixture of this with the gasoline sold the consumer is fortunate since the fuel itself appears to have no margin of quality to support dilution.

Very little oil research work has been undertaken in Spain and nothing accomplished although the character of the country would seem to justify a very thorough geological exploration. It has been so easy for the monopoly to buy and import foreign oil that there has been no substantial effort to develop the coal, shale and lignite distillation industries. We know of no move to acquire oilfields abroad though it is believed that C.A.M.-P.S.A. has a contract with a Spanish company having a financial interest in Venezuelan oilfields.

Although the decree of June 28, 1927 and the C.A.M.P.S.A.'s charters contain provisions to the effect that within five years after the establishment of the monopoly a refining industry with a production capacity equal to 80 percent of the country's consumption must be set up, very little has been done in this line and practically the whole of the imports consist of refined products.

In 1930 according to World Petroleum (Vol. 3, No. 9) the monopoly announced a most ambitious program which included the construction of a refinery at Barcelona, the purchase of tank steamers, formation of a company to be given the monopoly of transporting and distributing petroleum products to Spain, and so on. The banking group in control planned to form a company to operate the refinery in Barcelona; another company was to have charge of leasing all fuel pumps in Spain and still another company was to take up motor truck transport. For each of these enterprises the bankers planned to issue large amounts of stock to be sold to the public. So intense did opposition become on the part of the press and people, however, that this plan was abandoned.

During 1930 the construction of several tankers was begun in Spanish yards. Contracts were awarded to friends of those controlling the monopoly, and the prices for the tankers were some 60 percent in excess of those which could have been obtained under normal competitive conditions. Disregarding small coasting vessels the C.A.M.P.S.A. tanker fleet, according to the Baron report, totals 44,000 tons.

All in all the results obtained in Spain afford no argument in favor of a wider application of this idea. Dissatisfaction with the Spanish monopoly is general among the owners of motor vehicles, and there are many signs that the present system will ultimately be abandoned. It is concievable that Spain may stagger along under this burden as it has under many others but deliberately to force such a handicap on a great modern motorized nation like France—a nation which is an important manufacturer and exporter of automobiles and one which has led the world in the technical evolution of the modern motor car—would be to sin against the light.

It may be argued that Spain has been unfortunate in the manner in which the principle was applied or the selection of the instrument for its application. The fundamental truth is that the advantages of a petroleum monopoly are wholly mythical. No matter how industriously the exponents of this form of socialistic experiment pursue their bright bubble through the forests of oratory the substance will always elude them. The monopolists cannot point to a single successful example of the application of their theory to this commodity. A tacit admission of the limitations of the monopolistic doctrine is to be found in the fact that in practice its application is usually restricted to articles of luxury. Gasoline is a necessity of modern life.

A consortium of bankers, aided by a military dictator, forced this system on the people of Spain at a time when rigid censorship of the press prevented the free expression of public opinion. It is to be hoped that the progressiveness of the Japanese and the common sense of the French people, which is a byword, will prevent a repetition in those countries of Spain's tragic blunder. The self-deception of ideologues, backed by the rapacity of professional politicians must not be permitted to triumph over the interests of the public as a whole.

The defects of monopolies are inherent. They are notorious for inferior products and indifferent service. Political scandals are the almost inevitable concomitant of monopoly. The fair vision the monopolists describe is a mirage, an illusion.

Gasoline, we repeat, is a necessity of modern life. Those who produce it have served the public well and honorably. Every public need in peace and war has been anticipated. To deliver this vital business over to the bureaucrats is a step back into the dark ages.

Year's Progress in World's Refining Facilities

Great Activity in New Construction and Plant Improvement Due to Demand for Higher Test Motor Fuel and to Nationalistic Policies.

WIDESPREAD activity in the construction and improvement of refining plants has been the outstanding development in the petroleum industry during the past year. Two factors are mainly responsible for this expansion and betterment of refining facilities. First in importance has been the increasing demand for high test motor fuel resulting from changes in the construction of motor car engines. In certain countries, notably in France where a great amount of new construction has been under way, an important influence has been the nationalistic sentiment in favor of a greater degree of liberation from dependence on outside sources for motor fuel supplies. In the following pages is given a summary of noteworthy additions to the world's refining equipment. Because of the number of these enterprises only a brief description of their outstanding features is possible in the space available.

WHILE a number of very important new refineries have been completed or initiated in the United States during the past twelve months an even more outstanding phase of development in this country has been the installation of new processes and equipment. The swing of motor car manufacturers to high compression engines and the increased importance attached to octane rating has stimulated the demand for high test motor fuels. As a result refiners have found it necessary to modernize plants that were rendered obsolescent by the change in motor fuel requirements and to introduce up-to-date processes and equipment in order to meet the more exacting demands of their customers. Deeper cracking, permitting a higher proportional recovery of gasoline, and the introduction of recently developed processes enabling refiners to turn out motor fuel of a higher anti-knock rating, have been the order of the day. Changes in the marketing position of certain companies and the need for efficient operation as a consequence of the narrow margin between the prices of crude oil and products also have been factors in the location of various new plants.

Outstanding among the projects initiated during the year is the new refinery of the Pan American Refining Company, a subsidiary of Standard Oil Company of Indiana, which is to be located at Texas City, Texas. It is designed for a daily crude capacity of 30,000 bbl. and will be the world's largest single refining unit. It will include facilities for crude topping, depropanizing, viscosity-breaking, cracking, naphtha reforming, vapor phase clay treating and stabilizing. It will operate on East Texas crude and the composite gasoline will be of high anti-knock rating. Preliminary work is already under way. The topping and cracking installation is being designed by M. W. Kellogg Company and will utilize the process and patents controlled by Gasoline Products Company. A distillation unit consisting of tubular heater, fractionating towers and heat exchangers is being supplied by Foster Wheeler Corporation.

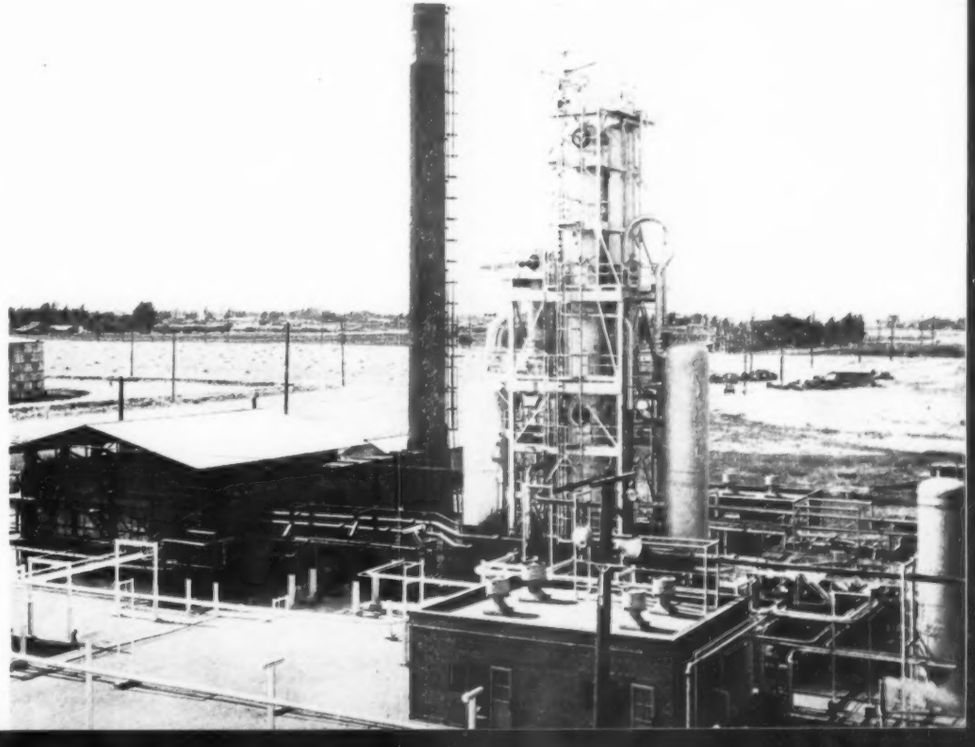
This new Pan American refinery will be an enlarged edition of the 19,000 bbl. plant completed last year at Whiting, Indiana, for Standard Oil Company of Indiana which has made a remarkable record for efficient and economical operation.

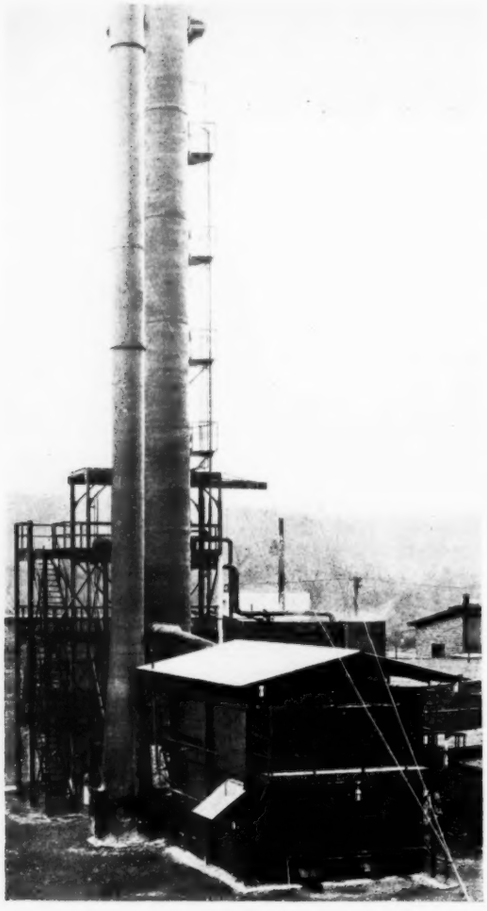
An important addition to the refining facilities of the Pacific Coast has been made by the General Petroleum Company, controlled by Socony-Vacuum Company, at Torrance, California. Like the plants previously described this one was designed and built by M. W. Kellogg Company and is licensed by Gasoline Products Company. The equipment includes a Kellogg radiant type tubular heater, a 200-lb. operating pressure evaporator and bubble tower fractionating system, a fuel oil flash tower, liquid and vapor heat exchangers and a stabilizer. The furnace feed is charged by means of high pressure and high temperature centrifugal pumps. Mechanical perfection was tested when the unit underwent a severe earthquake shock without damage shortly after completion.

The unit was designed and guaranteed to charge 6,350 barrels per 24 hours of straight run naphtha having an Engler boiling range between 300 deg.–420 deg. F. and an octane rating by the Series 30 Ethyl engine of not less than 45 percent. From this charging stock there was to be produced not less than 75 percent by volume of stabilized gasoline having an octane rating of not less than 80 by the Series 30 engine, 400 deg. endpoint, and 9–11 lbs. Reid vapor pressure or an octane rating of 78 for 8 lbs. Reid stabilized gasoline.

The unit also was to process 5,310 bbl. per 24 hours of a virgin charging stock consisting of a mixture of 3,890 bbl. of the heavy naphtha described above and 1,420 bbl. of straight run kerosene hav-

Cracking plant of General Petroleum Corporation's new refinery at Torrance, California.





Oil Creek Refining Company's 1,500 bbl. unit for handling Pennsylvania crude.

ing an Engler endpoint of not more than 475 deg. F., producing not less than 70 percent of 400 deg. endpoint stabilized gasoline with an octane rating of not less than 78 percent in the case of 8 lbs. Reid vapor pressure gasoline and an octane rating of not less than 80 percent by the Series 30 engine for 9–11 lbs. Reid vapor pressure gasoline. Upon completion the plant exceeded the guarantees in every respect.

Growth of production in the Michigan field has led to the erection by Pure Oil Company of a complete refinery near Midland for handling Michigan crude. The plant includes a distillation unit with bubble type tower and special vapor phase treating system, boiler plant, water system, loading rack and tankage. It has a capacity of 3,500 bbl. per day. Crude oil is delivered through an extension of the company's pipeline which runs from the Mt. Pleasant field to Bay City.

Pure Oil Company also has made extensive improvements in its Toledo refinery, including the installation of a naptha reforming unit with a capacity of 2,600 bbl. per day and a crude fractionating tower capable of handling 9,000 bbl. per day. These installations were made as a result of research by the company's own engineers and the operating results have been highly satisfactory, the octane rating from Michigan naptha running above 70.

At Heath, Ohio, the Pure Oil Company has installed a new still of a daily capacity of 8,000 bbl., incorporating the latest design of sectionally supported walls and arches and a most economical arrangement of radiant heating surface. At Muskogee three Diesel engines have been installed to drive electric motors and at Nederland, Texas, three large bubble towers have been erected to fractionate cracked distillate from the Cross unit.

In March last the new refinery of the Globe Oil and Refining Company started operation at McPherson, Kansas. Winkler-Koch Engineering Company designed and supervised the construction of the plant which has a daily capacity of 10,000 bbl. It is a combination topping-cracking unit, including a vapor phase recovery system and stabilizers, besides the usual power plant, loading and storage equipment and an up-to-date laboratory. Winkler-Koch also enlarged the cracking and topping unit and installed a reforming furnace in the Globe's refinery at Lemont, Illinois, and constructed a 3,600-bbl. cracking and reforming unit for the Red Ball Refining Company at Pampa, Texas.

One of the most recent projects in the line of new construction to be put under way is that of the Spartan Refining Company for two Gyro cracking units to be erected at Shreveport, La. The contract for this plant was placed with Alco Products Inc. in July last and construction work is now under way. The plant will handle the entire cracking stock from 10,000 bbl. per day of East Texas crude. It will be built with two cracking units with common after equipment in order that the entire plant capacity may not be tied up in a single operation.

In addition to the cracking units the same designer is building for the Spartan Refining Company a complete gas recovery and stabilization plant which will handle approximately 7,500,000 cu. ft. of gas per day. This equipment is being installed in connection with a polymerization plant for producing high octane gasoline extracted from Gyro gas, giving an overall yield of high octane gasoline exceeding that of ordinary methods of vapor phase cracking.

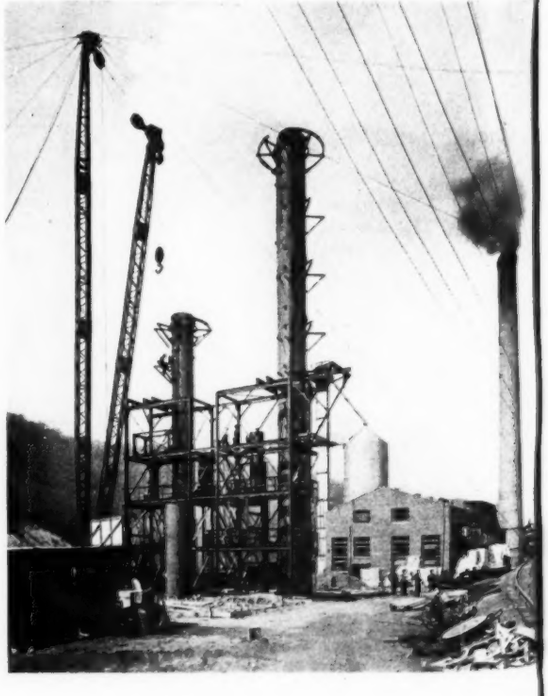
Another feature of the Spartan plant is a high pressure clay treating system for handling pressure distillate. With this method of treatment pressure distillate is maintained in the liquid phase and in that form is brought in contact with clay, giving a high grade of finished gasoline with a negligible loss in octane number and an extremely high throughput per ton of clay.

Bell Oil and Gas Company at Grandfield, Oklahoma, modernized and enlarged its Dubbs cracking unit, completely rebuilding its furnaces and installing an additional reaction chamber 5 by 40 ft., together with a flashing system consisting of a 7 by 65 ft. bubble tower and additional residuum strippers. In connection with these changes a Worthington Diesel engine and hot oil pump were placed in operation and a Burrell-Mase vapor recovery and gasoline stabilizer plant was installed. A Marley cooling system with a 2,400 gal. per minute circulation of water was another addition. The company also installed bubble towers and floor tubes in its skimming plant to skim 4,500 bbl. daily of 36 gravity crude oil.

As a result of the reconstruction of the Dubbs unit its throughput was increased from 30,000 to 60,000 bbl. of topped crude per month with a finished recovery of 55 percent of 400 endpoint gasoline and 40 percent of 10 to 12 gravity fuel oil. The treating system was remodeled to allow the use of a Universal Oil Products inhibitor by which acid treating has been eliminated.

An extensive program of refinery rehabilitation carried out by Shell Petroleum Company is now nearing completion. It involved the construction of new reforming units at five of the company's refineries. One of these, near Houston, Texas, is said to be the largest Dubbs reforming unit ever built. It converts over 1,000,000 gal. daily of straight-run gasoline into high test motor fuel, operating at temperatures over 1,000 deg. F. and at pressures of over

Crude Unit of Wolverine Empire Company with capacity of 1,800 bbl. daily.



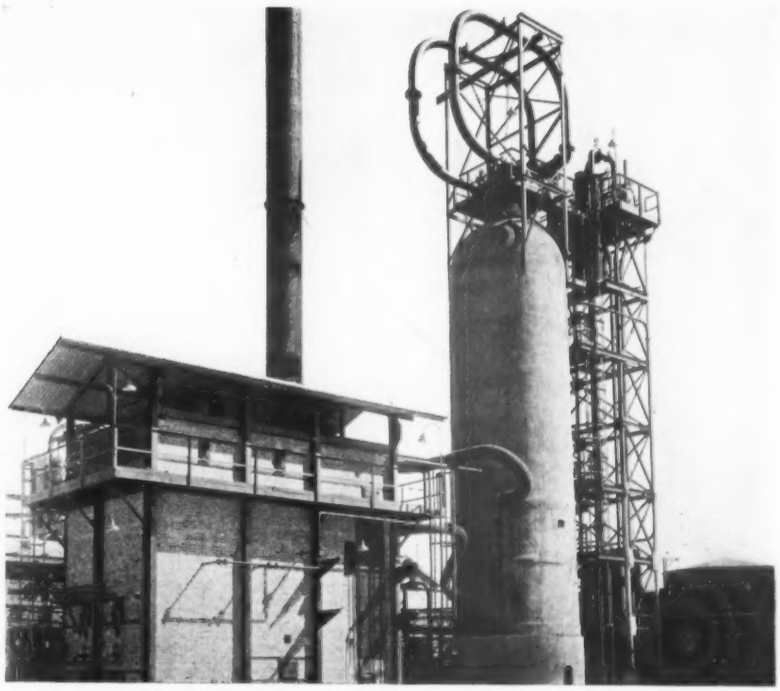
600 lbs. per sq. in. A 1,300-bbl., 24 hour pressure distillate stabilizer, installed by Alco Products Inc., an absorption plant, an ammonia treating system and extensive storage equipment are other features incorporated in this plant. At the Arkansas City, Kansas, refinery, Dubbs plants were remodeled to reform straight-run gasolines from Oklahoma and Kansas crudes. At the Norco refinery near New Orleans, Dubbs units were converted to reform heavier naptha fractions of gasolines and at East Chicago, Indiana, a new Dubbs plant is being installed to reform pressure distillate and straight-run gasoline. Use of a pressure distillate stabilizer permits control of vapor pressure to meet the specifications of high test motor fuel. The same company, at Wood River, near St. Louis, has erected a two tower naptha unit with up-to-date heat transfer equipment installed by Alco Products Inc.

For the past three years Sinclair Refining Company has been carrying on a broad program of modernization of its refineries. During the present year this has included the equipment of its plants at Kansas City and Coffeyville, Kansas, with new cracking units. These include, in addition to the stills, complete gas recovery and stabilizer equipment. The plants have been designed to permit not only the cracking of gas oil but also the reforming of straight-run gasolines and napthas. While these changes have been made primarily to improve the quality of products they have served also to lower operating expenses through the application of modern principles of refining.

In addition to the modernization of its cracking equipment at all of its six major refineries the company has added a cracking still together with the necessary auxiliaries, including treating plant, gas recovery and stabilization units, to its Fort Worth, Texas, refinery, thereby converting it from a skimming unit to a complete cracking plant. The stabilization equipment includes a 4,000 bbl., 24 hour pressure distillate stabilizer and debutanizer and a Braun heat exchanger.

In the Pennsylvania field numerous important additions to refining facilities have been made. Noteworthy among these is a new primary distillation unit with a rated capacity of 1,500 bbl. daily constructed for the Bradford Oil Refining Company by Leader Industries Inc. The unit was designed by Dr. E. H. Leslie. It was completed and put into operation in March last.

The plant embodies advanced features in design incorporated to overcome difficulties encountered with this type of apparatus in the past and is successful in handling Bradford crude with a remarkable degree of exactitude. The operation of the plant is conventional with other units of this type. The crude passes through exchangers which are on the side streams and bottom cuts and which transfer enough heat to give 300 deg. F. inlet temperature to the tube still. Thence the crude is raised to 665 deg. F. on the outlet of the tube still when running to 150 viscosity steam refined stock. The crude flashes into the vaporizer section of the tower and the volatile portions are vaporized and subsequently are drawn in side streams from the tower.



Vacuum tube still at refinery of Associated Oil Company, Avon, California.

The lubricating stock descends through the stripper section of the tower and by the use of superheated steam is stripped of its lighter components, giving consistently high Pensky-Martin flashes.

The gravity of the gasoline, 70.3 deg. A.P.I., is noteworthy as very few flash units obtain this high gravity and low endpoint without pre-flash towers. The gasoline is ready for market without acid treatment.

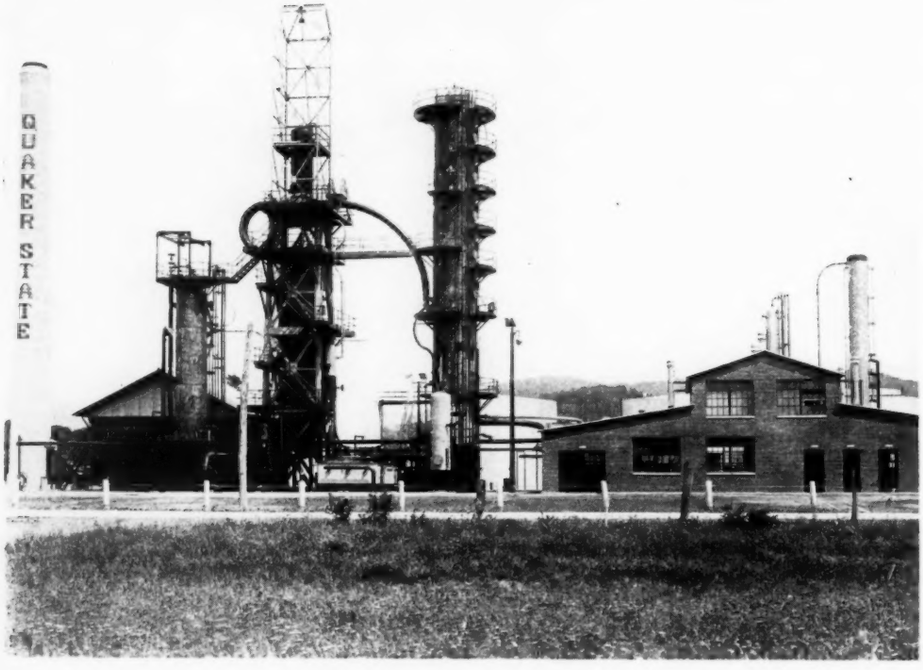
The naptha side-draw stream characteristics are variable to a great extent and it is possible to draw from this tower directly solvents and paint makers' napthas without refractionation except for a small stripping tower which controls the initial boiling point.

Treatment of the kerosene distillate has been reduced in cost about 30 percent due to the lighter acid and caustic treatment required, yielding a perfectly water white kerosene of sweet odor. The fuel oil is marketable as a straight domestic fuel, the only precaution needed being that the low cold test is preserved. Pressable wax distillate is drawn directly from the tower, yielding the comparatively high percentage of 180 viscosity at 100 viscous neutral with a four N.P.A. color before filtering.

The fractionating tower is 101 ft. high. Six side draws and one overhead gasoline cut may be made on this tower. In addition, the products of each of the twelve top trays may be blended in any way desired to meet unusual specifications. The design of the fractionating trays and bubble caps is a departure from conventional practice and their performance has been highly satisfactory.

At Bolivar, New York, Leader Industries, Inc. is directing the erection of a refinery for Allegany Refiners Inc. to handle 1,000 bbl. per day of locally produced Pennsylvania crude. It will include a pipe still distillation unit for the crude, a rerun unit for pressed oil and stock solution, shell still, boiler plant, pump house, wax plant, centrifuge plant, filter house, earth burning equipment, barrel and canning house, loading rack, tankage and other accessory equipment. The refinery will produce a full line of products which will be distributed through the company's marketing organization.

The Quaker State Oil Refining Corporation of Bradford, Pa., completed the reconstruction of its Farmer's Valley plant, in progress for the past two years. The final step in this program was the construction of a 1,250 bbl. gas oil and naptha Dubbs cracking unit which went into operation May 1, last. It raises the capacity of the refinery to 3,000 bbl. per day of Pennsylvania grade crude. The unit was erected complete with tankage and all facilities and equipped with a



Newly completed refinery of Quaker State Oil Refining Corporation of Bradford, Pennsylvania.

Struthers-Wells stabilizer for stabilization of cracked gasoline.

A crude unit with a capacity of 1,800 bbl. per day and a rerun unit for alternately processing pressed wax distillate and cylinder stock solution was constructed for the Wolverine Empire Company by Alco Products Inc. Two units are being built as a single plant with a common pump and control house. Particular emphasis has been placed on producing high quality lubricating oils from the crude operation and the rerun unit will produce high grade neutral oils to meet rigid market specifications.

The Oil Creek Refining Company has completed and placed in operation a 1,500-bbl. unit, handling Pennsylvania crude for the production of various light fractions, pressable wax distillate and cylinder stock. In the few months that it has been in operation the plant has shown a high degree of efficiency, exceeding all guarantees. One of the special features of this plant is the method of side stream control, giving closer control for the production of rigid specification products than has been the previous practice.

Canfield Oil Company has recently awarded a contract to Alco Products Inc. for the installation of improved distillation equipment at its Coraopolis plant. This installation includes a crude unit for handling 1,500 bbl. of Pennsylvania crude per day with particular emphasis upon the production of high grade lubricating oil and naphtha fractions to exacting specifications. This unit is illustrative of the trend in refining practice, producing eight fractions from a single fractionating tower. Equilibrium flash distillation gives low temperature operation in the tube still, which is of great importance in processing Pennsylvania crudes. A high degree of fractionation permits the simultaneous production of five narrow boiling point range products to meet the special specifications of the naphtha, kerosene and furnace oil markets. The same company is installing a special rerun unit for making low endpoint specialty products made from narrow boiling point range specifications.

Kendall Refining Company has placed in operation at Bradford, Pennsylvania, a high vacuum unit designed and erected by Alco Products Inc. This installation has a capacity of 500 bbl. per day, the charging stock being finished, viscous lubricating oil. It produces a finished lubricating oil with viscosities of over 500 at 210 Saybolt. The fractionating equipment in this installation is unusual in that the fractionating tower, vapor condenser and barometric condenser are combined in a single shell of all-welded construction, resulting in minimum back pressure and maximum vacuum at the point of flash.

One of the few existing plants for the recovery of commercially pure propane from refinery tail gas was designed for the Sun Oil Company by Alco during the year. This installation was made as an extension to the existing vapor recovery plant erected by the company in 1932 at Marcus Hook. The propane is recovered from absorption gasoline and from fractionating pressure distillate.

Units for fractionating pressure distillate and stabilizing light gasoline are under construction by Alco Products for Socony Vacuum's Paulsboro refinery and provision is incorporated for adapting these units for future propane recovery.

There has been particular activity during the year in the installation of heat exchange equipment. Among the installations in which new heat transfer equipment has been included are the two tower naphtha unit installed by the Shell Petroleum Company at its Wood River refinery and a debutanizer unit installed by Socony-Vacuum at its Paulsboro refinery. Cosden Oil Company rehabilitated its refinery equipment at Big Springs, Texas, in order to modernize its plant. Heat transfer equipment for all these installations was supplied by Alco Products Inc. Kanotex Refining Company has just placed an order for two high pressure Leach heat exchangers for its plant at Arkansas City, Kansas, and Panhandle Refining Company is adding two Leach heat exchangers to its Wichita Falls, Texas, refinery.

Gulf Refining Company has added to its West Port Arthur, Texas, refinery a 12,000-bbl. debutanizer, a 3,800-bbl. stabilizer and a 200-bbl. butane side stream stripper, including heat exchangers, preheaters, condensers and auxiliary equipment. At its Staten Island, New York, plant it has installed a tubular topping heater having a capacity of 15,000 bbl. per day. These installations were made by Foster Wheeler Corporation. The same company has supplied distillation units to Sun Ray Oil Company at Allen, Oklahoma; Union Oil Company, Oleum, California; Valvoline Oil Company, Butler, Pennsylvania, and stabilizing units to Wilshire Oil Company, Santa Fe Springs, California; Union Oil Company, Wilmington, California; and Cities Service Company, East Braintree, Massachusetts.

At Avon, California, the Associated Oil Company has installed a Badger cracking unit. Mid-Continent Petroleum Corporation has placed in its West Tulsa, Okla., plant a Foster Wheeler tubular cracking heater having a capacity of 27,700 bbl. daily.

Marathon Oil Company has enlarged the facilities of its refinery at Fort Worth, Texas, by the addition of a 1,500-bbl. viscosity breaking and vapor phase cracking unit with stabilizer and has included a similar unit in its plant at Bristow, Oklahoma. Both these installations were made by M. W. Kellogg Company and the

same company has supplied the Continental Oil Company with two Cross cracking units capable of cracking 2,400 bbl. of gas oil daily. This installation was made at Ponca City, Oklahoma. At the Continental's Glenrock, Wyoming, refinery a combination topping, cracking, reforming, stabilizing and vapor phase clay treating unit handling 2,860 bbl. daily has been installed. Big West Refining Company has placed in service at Kevin, Montana, a full flashing Dubbs unit of 750 bbl. capacity to run on Kevin-Sunburst crude. This installation was made under the supervision of Ralph M. Parsons, consulting and contracting engineer.

Outside the United States the greatest amount of construction has taken place in France. So important are these developments that they have been made the subject of separate articles which appear in following pages. Many interesting and important projects have been carried forward in other countries, however, and some of the more noteworthy of these may be mentioned briefly herewith.

While extensive improvements have been made in the refining equipment of Roumania these have been largely in the form of additions to existing installations. A noteworthy modernization program which has extended over the past two years is that of Steaua Romana. This includes a Burrell Mase system for the rectification of natural gasoline, a Dubbs cracking unit, a Reichling system, a Gray process refining installation and barrel making equipment for the asphalt plant.

In the Burrell Mase installation all the gas from refinery tanks as well as from condensers where benzine is distilled is handled by four rotary compressors of 1,800 c.m. per hour, put into motion by electric engines of 85 h.p. which compress the gas to about 2½ atm. The compressed gas, after cooling, passes to a receptacle where it is washed with lime juice and then goes to an absorbing column where the gasoline can be absorbed by motorine in 105,000 c.m. daily. The dry gas, after passing through a pressure reducer, goes into the gas lines of the refinery and is used as fuel. The motorine passes into an expander whence a centrifugal pump conveys it into a column boiler equipped with bubble trays for rectification. From the boiler it passes through a pre-heater and is then pumped through a cooler into the absorber.

The Dubbs unit, with a capacity for handling 25 cars of motor fuel per day, has been completed with a Badger rectifying installation having a capacity of 28,340 litres. The rectifier is also provided with a superheater which serves for the concentration of residue.

The Reichling installation is capable of cleaning 70 c.m. of water per hour, using about 50 gr. of NaCH and 15 gr. of Triantrium-phosphate with the help of four filtration columns and two cleaning tanks.

In the Gray refining installation the gasoline is passed partly through a filtrator with sulphur and partly through a two-column mixer and into storage tanks.

The barrel making installation is able to turn out 450 iron barrels with a capacity of 165 litres in a day of eight hours.

Improvements installed at the Ploesti refinery of the Dacia Romano Petroleum Syndicate include a Stratford crude distilling installation handling 600 tons daily and a continuous refining unit with a capacity of 150 tons daily, an electric installation with two Sulzer Diesel engines of 500 h.p. each, directly connected with triple phase generators and an installation of Byron Jackson centrifugal pumps connected with electric engines for the manipulation of products within the refinery. Other additions to this plant include a loading station, a new machine shop, an agitator of 90 tons capacity and increased storage capacity of 22,710 tons.

Other Roumanian companies which are placing new installations in their refineries are the Unirea and the Colombia.

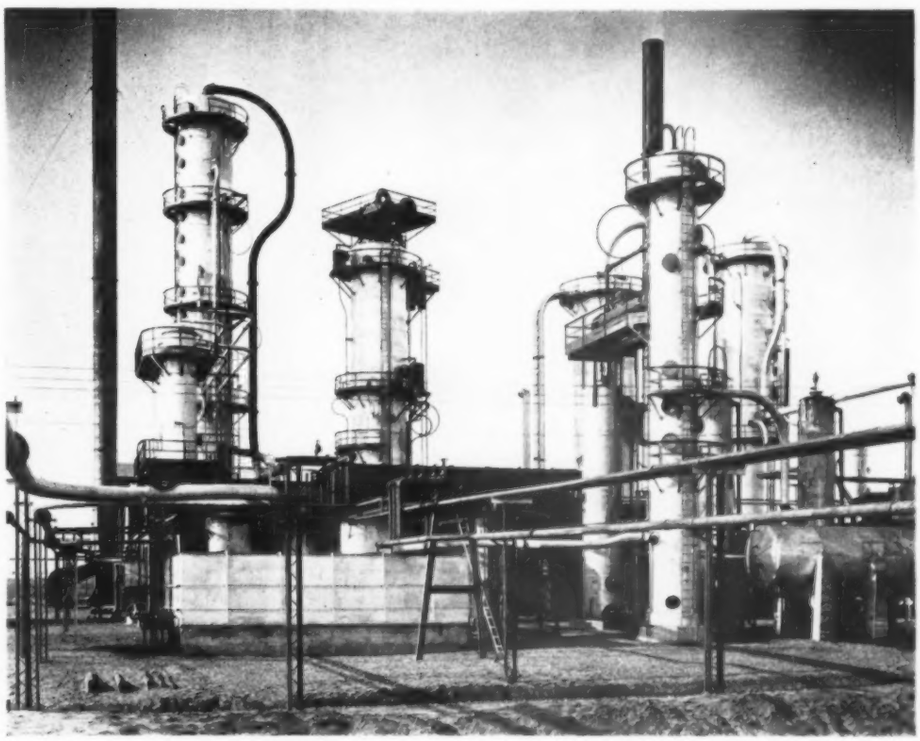
One of the interesting governmental projects now under way is a Gyro cracking unit being built at Kudamatsu to supply the Imperial Japanese Navy with high octane motor fuel. The plant is of 1,000–1,500 bbl. daily capacity and includes a complete gas recovery system for extracting high volatile gasoline and for maintaining the desired vapor pressure on the finished motor fuel. In conjunction with the plant, which is being constructed by Alco Products Inc., is a complete liquid phase clay treating system designed to process the cracked distillate with minimum loss in octane number.

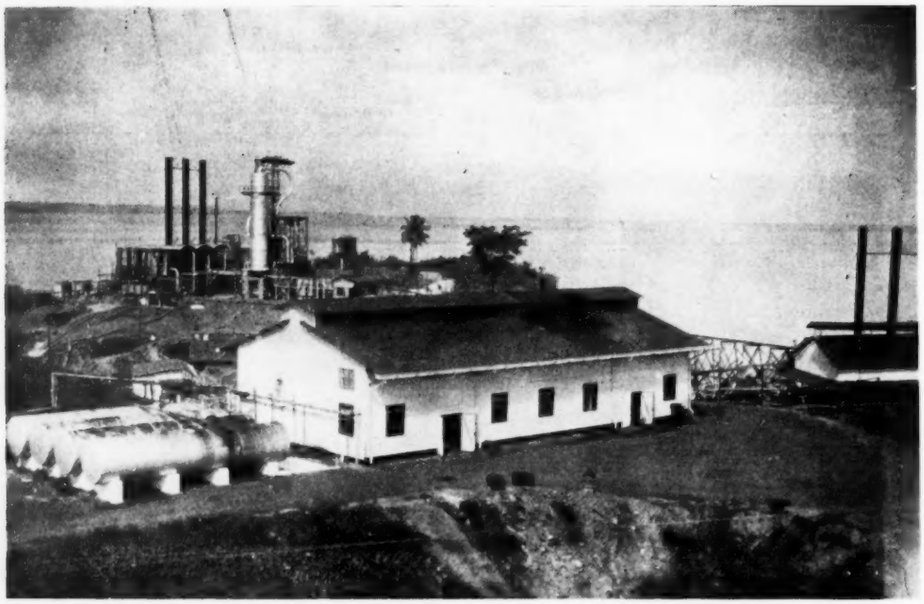
As a more recent development this installation includes a polymerization plant for producing high octane gasoline from the cracked gas which normally goes to the refinery waste gas system, thereby producing a considerably higher yield of valuable motor fuel than has heretofore been obtained in vapor phase cracking. A Cross cracking unit of 1,000 bbl. daily capacity with pressure distillate stabilizer has been ordered from M. W. Kellogg Co.

Early in the year the Argentine Government Oil Fields placed in operation a 2,500-bbl. vacuum unit for the treatment of reduced crude to produce high grade lubricants. The designer incorporated provisions for simultaneously producing four grades of lubricating oils to various flash and viscosity specifications. While primarily intended to handle reduced crude the plant will alternately process Edeleanu treated lubricating oil distillate.

Construction of this plant was carried out by the company from designs and material supplied by Alco Products Inc. which also installed an atmospheric

Globe Oil and Refining, Company plant at McPherson, Kansas, showing debutanizer tower in foreground.





New plant of United British Oilfields of Trinidad at Point Fortin.

distillation unit for use on solution reruns or alternately for a topping operation. Included in this vacuum plant is a unit condensing system developed by the designers for high vacuum work. The arrangement of the bubble tower represents an advance in the art of bubble tray construction.

In its plant at La Plata the Argentine Government Oil Fields installed a Kellogg high and low pressure cracking unit processing gas oil from Argentine crude.

At Campana, Argentina, Standard Oil of New Jersey is erecting a lubricating oil plant.

The Vacuum Oil Company and The Texas Company are arranging for the construction of a refinery in Buenos Aires at Dock Sud, on a site bordering the Rio de la Plata. The products from this refinery will be marketed in Argentina by the Ultramar Sociedad Anonoma Petrolera Argentina.

Part of the tankage is already up, and it is expected that the refinery will be completed within the next few months. A 2,400 bbl. crude topping and de Florez cracking unit is being built for their plant by M. W. Kellogg Co.

The crude capacity is approximately 3,000 bbl. per day. Equipment is being provided for complete refinery operation including cracking. Plans have been made so that crude oil can be delivered to the refinery both from foreign and local sources.

It is expected that the refinery will be in a position to meet all requirements of the Vacuum Oil Company, Inc., and The Texas Company, who formerly operated separately in Argentina.

Diadema Argentina S. A. de Petroleo has installed in its plant at Buenos Aires two Dubbs cracking units of 1,500 bbl. daily capacity each.

An important addition to the refining facilities of Trinidad is the new topping plant at Point Fortin built by United British Oilfields of Trinidad. The plant has a capacity of 1,000 tons of crude oil daily. It was designed by the technical staff of the Royal Dutch Shell group of which United British Oilfields is a member and, with various auxiliary equipment, was put into operation in July last.

The main features of the topping plant are four pipe-still heaters, each containing 95 four-inch steel tubes, a steam superheater, an evaporator of two meters diameter, a stripping column of 1.2 meters diameter, together with condensers, heat exchangers, feed pumps and reflux pumps.

Crude oil is passed through residue heat-exchangers to the four pipe stills in parallel, from which heated crude oil is passed to the evaporator where the oil is flashed with the assistance of steam. A constant level is kept in the evaporator by means of a Fischer automatic level controller and residue is drawn off to the rundown tanks via the heat-exchangers. The vapor from the evaporator is passed to the main bubble tower from the bottom of which gas oil is taken, a side stream giving kerosene or white spirit fraction and the top of the column giving gasoline of required endpoint. The endpoint of the gasoline is controlled by means of an automatic temperature controller which regulates the quantity of cold reflux pumped to the top of the bubble tower. The side stream from the main bubble tower is passed to a smaller bubble tower which acts as a stripping column, fractionating the kerosene or white spirit as desired.

The plant is supplied with temperature and pressure recorders, automatic level and temperature controllers, with the result that perfect control at all points is obtained.

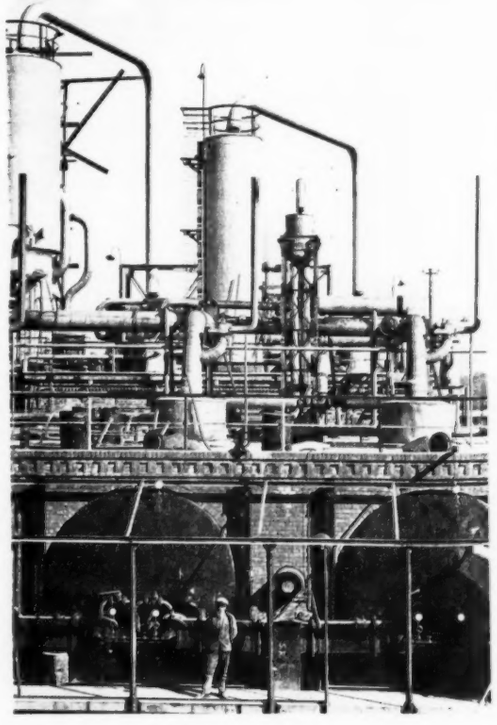
In order to handle the increased production from the new topping plant additional tankage has been erected. Two tankers can be moored simultaneously at a new jetty 8,500 feet in length, which carries four pipelines for oil and water and on which provision has been made for loading packaged products.

The boiler house and fresh water facilities have been enlarged, and a new electric station containing two Lancashire 200-kilowatt generators driven by Ruston-Hornsby 6-cylinder vertical Diesel engines has been erected.

A number of improvements have been made in the Trinidad refinery of the Standard Oil Company of New Jersey. These have been directed mainly to increasing the output of high grade kerosene for local consumption and have included an enlargement of the case and can facilities of the plant.

On the island of Aruba alterations have

Stratford installation at plant of Steaua Romana's Campina, Roumania.

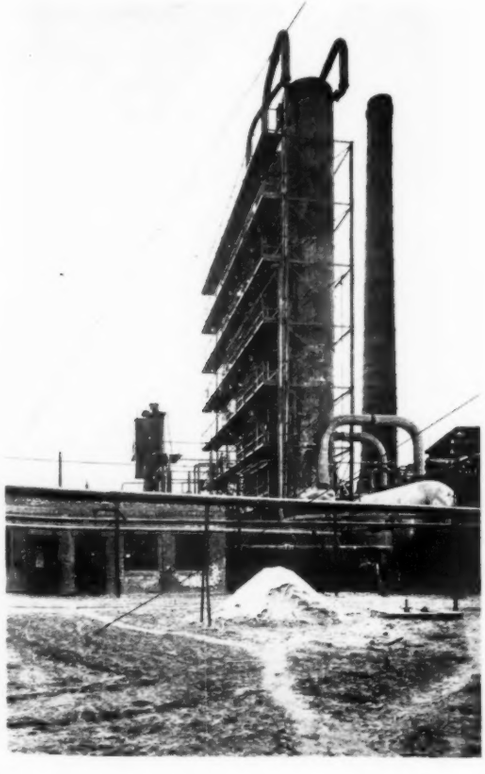


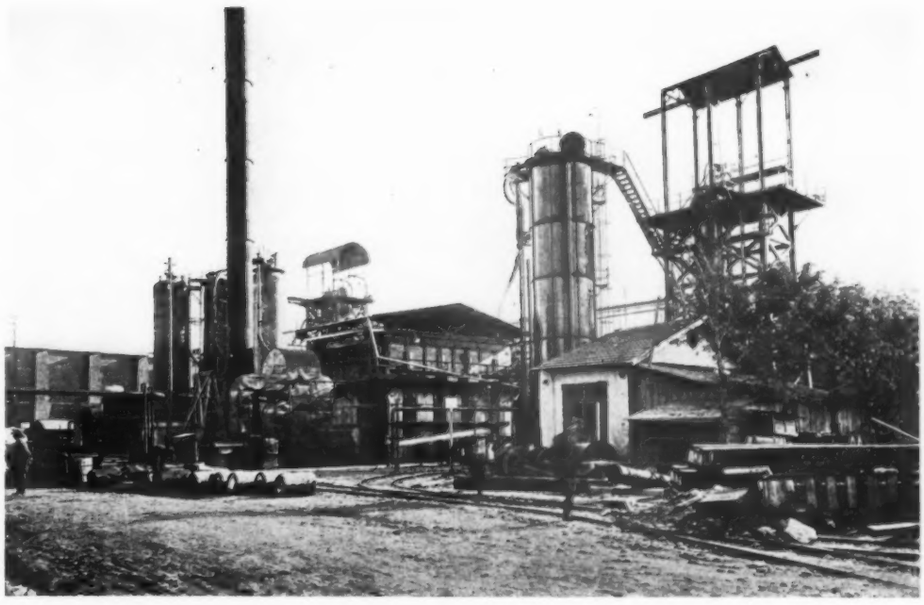
been made in the refinery acquired last year by Standard Oil of New Jersey when it purchased the foreign properties of Pan American Petroleum and Transport Company. As a result of these changes the plant is enabled to produce certain varieties of oils not formerly required from this installation. Early in the year sixteen Leach high pressure exchangers were installed in this plant.

In Mexico the Compania Mexicana de Petroleo El Aguila is erecting a Gyro vapor phase cracking unit to process approximately 2,000 bbl. per day of gas oil or 2,500 bbl. of reduced crude. This installation will bring the company's vapor phase cracking capacity up to roundly 5,000 bbl. of charge per day for the production of high octane motor fuel.

The company also placed with Alco Products Inc. a contract for a complete gas absorption and stabilization plant for its vapor phase refining operation. This plant will handle 7,000,000 cu. ft. of gas per day for 90 percent butane extraction. An additional contract placed with the same company covers a reduced crude unit for the manufacture of fuel oil from heavy residue. This plant will have a nominal capacity of 7,500 bbl. of charge per day and will be able to handle 10,000 bbl. per day under slightly different operating conditions.

Pipestill installation at Ploesti Refinery of "Unirea," Roumania.





Dubbs cracking installation at Campina Refinery of "Steaua Romana," Roumania.

Standard Oil of New Jersey has installed a gas oil cracking unit in its refinery at Tampico, Mexico.

Huasteca Petroleum Company has added to its refinery near Tampico, Mexico, a vapor phase cracking unit and stabilizer built by M. W. Kellogg Company. It handles 3,500 bbl. of crude daily and produces gasoline of high anti-knock rating.

One of the noteworthy gasoline recovery installations of the year was that engineered by Alco Products Inc. for the Imperial Oil Company at its Turner Valley field in Alberta, Canada. This plant extracts gasoline from natural gas under a casinghead pressure of approximately 350 lbs. per sq. in. Due to the high percentages of fixed gases contained in the inlet wet gas the rich oil leaving the absorbers contains large percentages of methane, ethane and propane. The distillation unit is so designed that these light vapors are removed from the system without resort to recycling, unduly high distillation pressure, or loss of appreciable valuable gasoline constituents. The plant is designed to process approximately 100,000,000 standard cu. ft. of gas daily. Foster Wheeler supplied the absorbers for this plant.

Another outstanding gasoline recovery and distillate fractionating installation in Canada is that of the Shell Oil Company of Canada, Ltd. at Montreal which began operation early in the year. This plant is equipped to turn out high anti-knock motor fuel and fuel oil. It was designed and erected by Alco Products Inc. in conjunction with that company's Canadian associate, the Montreal Locomotive Works. A detailed description of the plant was published by WORLD PETROLEUM in June last.

Shell Oil Company of British Colombia completed during the year at Burnaby, B. C., Canada, an atmospheric topping unit having a capacity of 3,500 bbl. per day, complete with tubular oil heater, fractionating tower, heat exchangers and 700 g.p.m. cooling tower. The installation was made by Foster Wheeler Corporation.

Imperial Oil Company, Ltd., added to the equipment of its refinery at Imperoyal, Nova Scotia, Canada, a Foster Wheeler stabilizing unit and installed in its refinery at Okotoks, Alberta, Canada, an absorbing unit, built by the same company, which is a duplicate of three units installed last year.

During the summer the British American Oil Company installed at its Toronto, Canada, refinery a two tower solvent unit for the production of special solvents for various light oil charging stocks. In designing this unit it was made sufficiently flexible to allow for the production of a wide variety of products. Alco Products Inc. supplied the heat exchangers.

▼

New French Refinery

AT MARTIGUES, in the south of France, near Marseilles, the Compagnie Française de Raffinage has begun the construction of its second refinery which will be completed during 1934 and will have an annual capacity of 750,000 tons.

La Raffinerie de Port Jérôme de S.F.A.R.

L'Organization et l'Equipment de la Grande et Nouvelle Raffinerie Construite pour le Ravitaillement de Produits Petrolifères au Marché Français

SI DÈS 1928 le Parlement français votait les lois qui constituent le nouveau statut de l'industrie du pétrole en France, c'est seulement en Avril 1931 que furent promulgués les décrets autorisant la construction des nouvelles raffineries.

Pour rénover en France l'industrie du raffinage, complètement abandonnée depuis 1914, et reconnaitre les charges que la nouvelle législation a imposées aux pétroliers, le Gouvernement français a principalement prévu, dans ses dispositions législatives, l'institution d'une protection douanière en faveur des produits des raffineries françaises. Mais les conséquences de ces nouvelles dispositions, le fait depasser d'un régime d'importation à un régime de raffinage, posèrent de nombreux problèmes dont nous nous bornerons à dire qu'ils furent petit à petit résolus au mieux, semble-t-il, des intérêts du pays et des industriels. Il convient ici de dire comment se constitua la Standard Franco-Americaine de Raffinage l'obligation de raffiner en France qu'imposaient pratiquement les lois nouvelles, créait de très grosses difficultés aux sociétés de distributions spécialisées en certains produits du pétrole et organisées exclusivement pour leur vente. C'est ainsi que pour équilibrer harmonieusement le raffinage et la distribution, se rapprochèrent les sociétés suivantes: Sté Anonyme André Fils; Sté de La Mailleraye; L'Economique; Bedford Petroleum C°; Compagnie Générale des Pétroles.

Bénéficiant des moyens et de la technique des trois grandes sociétés américaines—Standard Oil Company of New Jersey, Gulf Refining C°; Atlantic Refining C°—la S.F.A.R., émanation des susdites sociétés françaises, a réalisé, en vue de leur ravitaillement, une raffinerie moderne dont la capacité de production atteindra un million de tonnes.

Pour l'établissement de l'usine projetée, un pays riverain de la Seine Maritime devait admirablement convenir puisque déjà, et depuis longtemps, de Rouen à la mer, ce beau fleuve coule, en plusieurs points de son voyage, entre d'imposantes in tallations pétrolières jusques auxquelles, grâce à lui, grâce à ses eaux calmes et faciles, ont remonté depuis de longues années et remontent encore, les navires-citernes de ravitaillement dont le tonnage total, pour les sociétés intéressées, représente plus de 50% de leurs importations en France.

C'est donc à juste titre que Port-Jérôme—nom évocateur d'un voyage que fit en cette région Jérôme, frère de Napoléon—fut choisi pour recevoir sur son sol accueillant, dans un site charmant, l'une des plus importantes usines de France, intermédiaire puissant et actif entre les gisements pétrolifères et les consommateurs de tous les produits du pétrole.

Cette raffinerie occupe 700 mètres en bordure de la Seine et plus de deux kilomètres et demi en profondeur, soit environ 190 hectares; quatre avenues dans le sens de la longueur et sept rues perpendiculaires aux avenues partagent le terrain utilisé en 24 blocs.

Les installations ont été prévues pour des augmentations pouvant tripler la production du début.

Les travaux de construction commencèrent effectivement en Juillet 1931 et le premier Mai 1933, une première batterie de distillation était mise en route. On prévoit qu'à la fin de l'année la raffinerie aura atteint sa capacité normale d'exploitation.

La Raffinerie de Port-Jérôme a été prévue, aux termes des décrets gouvernementaux, pour une production annuelle de 356.000 tonnes d'essence; 38.000 tonnes de pétrole; 45.400 tonnes de gas oil et 139.000 tonnes d'huiles de graissage.

Ceci est le présent, l'avenir, certainement, verra naitre et prospérer dans cette région ainsi acquise au progrès, d'autres industries annexes qui reconnaitront son bon accueil en assurant son développement économique.

Reception des Petroles Bruts

ACTUELLEMENT, la Seine ne permet pas aux grands pétroliers de remonter jusqu'à Port-Jérôme. La S.F.A.R. a cependant réalisé la première partie d'un port prévu pour recevoir ultérieurement

Suite à la page 316

General view of Port Jerome Refinery under construction, looking toward the Seine. Crude pipe lines in foreground.

Standard Franco-American's Refinery

New Plant at Port Jerome Equipped to Supply Company's Products to French Market—Includes Model Village for Housing of Workers.

ALTHOUGH it was in 1928 that the French Parliament passed laws providing a new basis for the French petroleum industry it was not until April 1931 that decrees were promulgated authorizing the construction of new refineries. This legislation, involving a transition from an importing régime to a refining régime, necessitated numerous changes among the organizations previously engaged in supplying petroleum products to the French market.

Benefiting by the experience and technical knowledge of the three great American companies—Standard Oil Co. of New Jersey, Gulf Refining Co., and Atlantic Refining Co., Standard Franco-Americaine du Raffinage has erected a modern refinery which will have a capacity of 1,000,000 tons. For harmonizing refining and distribution arrangements have been made with the following companies: Ste Anonyme Andre Fils, Ste de la Mailleraye, Bedford Petroleum Co. and Compagnie General des Petroles.

For the location of the new refinery a site was selected at Port Jerome, on tidewater in the maritime section of the River Seine, between Rouen and the sea. The refinery site occupies an area of 190 hectares (about 470 acres) with a water frontage of 700 meters. Allowance is made for eventually tripling the capacity of the plant should conditions require it.

Construction began in July 1931 and the first distillation battery was put into operation May 1, 1933. It is anticipated that by the end of the year the refinery will be in full normal operation. According to governmental decree the refinery is to be equipped to turn out annually 356,000 tons of gasoline, 380,000 tons of kerosene, 45,000 tons of gas oil and 139,000 tons of lubricating oil.

Until the work of deepening the river has been carried out, large tank steamers bringing crude to the refinery will discharge at Havre into reservoirs of the Compagnie Industrielle Maritime and the oil will be conveyed to Port Jerome by means of a pipe line 35.5 kilometers long. The company's storage capacity at Havre amounts to 30,000 cubic meters.

From the reservoirs the oil passes through 300 mm. pipes to a pump house containing three large double plunger duplex effect pumps operated by electric motors of 750 H.P. The station can handle 5,000 to 8,000 tons of crude per day and with the plant in normal operation will average 3,000 tons. The motors are of the asynchronous type and are installed in a room separate from the pump house. They may be placed under a potential of 3,000, 3,750 or 5,000 volts which gives the installation a high degree of flexibility.

The pipe line which receives the oil from the pump house is of 250 mm. diameter and for that part of it which extends under the city there is a second line of 200 mm. which ultimately will be extended to Port Jerome. The pipe is protected by asbestos covering. The line is the largest thus far built in France and is the first welded line to be laid there. At the refinery the crude is stored in reservoirs 120 x 42 ft. of which there are eight. The tanks are provided with floating roofs of the Wiggins type and have a capacity of 675,000 bbl.

Distillation Equipment

FOR its distilling operations the refinery is equipped with two units of two stages each, comprising a pipe-still, plate column, condensation equipment, heat exchangers and coolers. In each of the units the crude is pre-heated and then passes into the pipe-still of the atmospheric stage where it is raised to the temperature necessary for the first reduction in the atmospheric tower. Certain fractions are successively condensed in each of the three groups of plates and the head products escaping from the column in a vaporized state are finally condensed. The parts that remain liquid at the temperature of the zone of expansion are sent, after rectification by steam, to the accumulator and serve as feed for the second stage.

The reduced crude is taken up, heated in the second pipe-still and again frac-

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View from waterfront of Refinery of Standard Franco-Americaine de Raffinage at Port Jerome, France.

tous ses bateaux lorsque les travaux d'approfondissement du chenal en Seine auront été menés à bien. En attendant, les bateaux viendront au Havre où les cargaisons seront déchargées dans les réservoirs de la Compagnie Industrielle Maritime.

Le transport de l'huile brute à la raffinerie est assuré au moyen d'un pipe-line d'une longueur de 35 km. 500. Les pétroliers accostent au Havre aux appontements, qui sont au nombre de quatre. Chaque appontement est relié, par deux canalisations de 250 m/m de diamètre, aux réservoirs de stockage dont la capacité totale affectée à la S.F.A.R. atteint 30.000 m³. Le réseau de canalisations rend possible le refoulement de l'huile brute de n'importe quel appontement vers n'importe quel réservoir.

Des réservoirs partent les canalisations de reprise des hydrocarbures, d'un diamètre de 300 m/m, allant vers la pomperie où se trouvent installées trois grandes pompes à plongeurs. Les pompes sont horizontales, alternatives, à action directe, à plongeur double effet Duplex et commandées par moteur électrique. La puissance totale de la station est de 750 C.V. et permet le refoulement journalier de 5.000 à 8.000 tonnes d'huile brute; la cadence journalière de pompage sera en moyenne de 3.000 tonnes.

Les pompes sont reliées entre elles de façon à obtenir des débits variables qui sont déterminés par les facilités de stockage au Havre et par la viscosité de l'huile refoulée. Chaque pompe est munie d'un dispositif de graissage automatique avec retour d'huile au bac de filtrage; ce retour d'huile est effectué à l'aide d'une petite pompe.

Looking down the Seine from Standard Franco-Americaine's refinery showing dock for loading river craft.

Le pipe line ayant son origine au noeud de vannage de la salle des pompes est composé de tubes de 250 mm. de diamètre. Il a une longueur de 35.5 km. et se trouve doublé sur une longueur de 4,5 km. dans la traversée du Havre par une deuxième canalisation d'un diamètre de 200 mm.

Cette canalisation est une amorce d'un deuxième pipe line qui sera prolongé ultérieurement jusqu'à Port-Jérôme. Les tubes sont soudés bout à bout et sont enterrés à des profondeurs variables fixées par les autorités du Port-Autonome du Havre et les Ponts et Chaussées de Rouen (0,60 m. à 1,00 m.).

Les tubes livrés en tronçons d'une longueur d'environ 10 mètres avaient leurs extrémités chanfreinées et les soudures, au nombre de 4.000, ont été exécutées au chalumeau. Les tubes ont été enduits d'une gaine protectrice en ciment, dans les parties habitées du Havre. Une toile d'amiante goudronnée a été appliquée sur les tubes avant de les descendre dans la tranchée. Sur son parcours, le pipe-line traverse en siphons le Canal de Tancarville et la Rivière de Radicatel. Le pipe line Le Havre/Port-Jerome est le plus grand construit en France et le premier réalisé par tubes soudés.

Le stockage des pétroles bruts est effectué dans de grands réservoirs de 36 m. 60 de diamètre sur 12 m. 92 de hauteur (120′ x 42′), munis de toits flottants du type Wiggins.

Ces réservoirs sont au nombre de huit et représentent une capacité totale de stockage de pétrole brut de 108.000 m³ (675.000 barils de 42 gallons).

Batteries de Premiere Distillation

POUR la distillation du brut, la Raffinerie de Port-Jérôme est équipée de deux unités de distillation, chacune à deux étages. Chaque étage comporte un four, une colonne à plateaux, un équipement de condensation, d'échange, de chaleur et de refroidissement.

Dans chacune des unités, le brut est préchauffé d'abord dans les condenseurs des produits de tête des colonnes atmosphérique et sous vide, ensuite dans un échangeur situé sur le reflux intermédiaire entre le 2ème et le 3ème groupe de plateaux de la tour sous vide et, enfin, dans les échangeurs du dernier soutirage et des résidus de la colonne sous vide.

A la suite de ce préchauffage, il passe dans le four de l'étage atmosphérique où il est chauffé pour maintenir dans la zone d'expansion de la tour de distillation la température nécessaire à la première réduction du brut, dans la tour atmosphérique. Les parties vaporisées à cette température s'élèvent dans la colonne.

Certaines fractions sont successivement condensées dans chacun des trois groupes de plateaux et enfin les produits de tête s'échappent de la colonne à l'état de vapeurs et sont ultérieurement condensés. Les parties liquides à la température de la zone d'expansion sont envoyées, après rectification à la vapeur, dans le fond de la tour, dans l'accumulateur.

Elles constituent l'alimentation du 2ème étage.

Le brut réduit est repris, chauffé dans le 2ème four et de nouveau fractionné en produits de tête, soutirages et résidus dans la colonne sous vide.

Les caractéristiques des éléments principaux de chaque batterie sont les suivantes:

Etage Atmospherique

1—**Four et Serpentin.**—Le faisceau tubulaire comporte 100 tubes en série, dont 35 tubes à ailettes et 35 tubes lisses, dans la zone de convection, et 30 tubes dans la zone de radiation. Le four est pourvu d'une cheminée en tôle et comporte 6 brûleurs auxquels correspondent 6 moufles.

2—**Colonne atmospherique.**—La colonne cylindrique verticale, comporte des plateaux à calottes. Un trou d'homme est aménagé dans chaque intervalle entre les plateaux. La colonne atmosphérique comporte des sections de revaporisation avec tiroirs de soutirage.

3—**Réservoirs de réception.**—A chaque soutirage correspond un réservoir de réception, cylindrique, horizontal, réuni à la partie inférieure de la section de revaporisation par une ligne de soutirage et à la partie supérieure de cette section par une ligne d'équilibrage de pressions.

Les différents produits obtenus correspondent à de l'essence légère, essence lourde, pétrole lampant et gas oil.

Le pétrole brut réduit, qui s'accumule dans le bas de la tour, passe de là dans un accumulateur.

Etage Sous Vide

1—**Faisceau tubulaire et Four.**—Le faisceau tubulaire du four comporte 118 tubes répartis en 40 tubes à ailettes et 40 tubes

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tionated into head products, draw-offs and residue in the vacuum column.

The principal features of each battery are as follows:

Atmospheric Stage

The coils are arranged with 100 tubes in series. The pipe-still is equipped with six burners. The cylindrical atmospheric column includes a revaporization section with draw-offs. It is provided with bonnet plates, a manhole being placed in each interval between the plates. For each draw-off there is a horizontal cylindrical reservoir connected to the lower portion of the revaporization section by draw-off lines and to the upper part of the section by a line for equalizing the pressure. The products obtained are light essence, heavy essence, lamp oil and gas oil. The reduced crude collected in the bottom of the tower passes thence into an accumulator.

Vacuum Stage

The tubes are arranged in groups of 118 including 40 baffled and 40 smooth tubes in the convection zone and 38 smooth tubes in the radiation zone. The vacuum column is 24 meters in height with a diameter ranging from two to five meters. As in the case of the atmospheric column it is divided into a number of revaporization sections and is supplied with draw-offs. All the receiving reservoirs are connected to the top of the tower by an equalizing line. They are equipped with barometric jet condensers with two-stage ejectors.

Condensing and Recovering Apparatus

In the atmospheric stage the head products are condensed in a two-section condenser, the first utilizing crude oil, the second water. The draw-offs are cooled in coolers of the ordinary water type. In the vacuum stage the head products are condensed in a condenser utilizing crude oil and the condensation is finished in a water condenser. The draw-offs are cooled by water coolers of the ordinary type. The cooler of the last draw-off is in series with an exchanger which heats the crude. The residues are cooled in two water exchangers. There is also a spare cooler consisting of a coil placed in a tank. Gas oil, lubricating distillates and a residue are collected from the vacuum tower.

In order to provide the various products distributed by its associated companies the Port Jerome refinery will treat at least two kinds of crude and each battery will thus be able to work on a special crude. The capacity of each unit is about 1,500 cubic meters per day.

Cracking Equipment

ON ACCOUNT of its large output of gasoline the company had to provide an installation adequate for cracking its gas oil and residues. For this purpose it has installed three "Tube and Tank" cracking batteries of 1,000 lbs. pressure per sq. in., each battery consisting of a furnace, a radiation section and a convection section. Each battery comprises two towers. The primary tower is divided into two parts of which the lower one serves as an accumulator and carries no plates while the upper part is furnished with eight fractionating plates and a coil for reheating the liquid placed at the top of the tower. The secondary tower is composed of two series of fractionating plates separated by a preheating coil. The lower part of the tower is divided by a partition, one of its chambers being provided with a level regulator. Each battery has a capacity varying between 18,000 and 32,000 liters per hour according to cracking conditions.

The liquid to be treated is pumped by means of a steam pump to the coil of the secondary tower and from there to the coil of the primary tower. These two coils may be partly or wholly by-passed according to the pre-heating desired. The liquid thus pre-heated passes into an accumulator whence it is conveyed to the tubes in the furnace by two reciprocating total feed pumps, one driven by electricity and the other by steam.

In the reaction chamber the cracking is effected in the liquid phase. After remaining in the chamber under a pressure of 50 to 70 kilograms the cracked products are released and enter the tar separator where the liquid tar and condensed tar vapor are collected, while the other vapors pass into the primary tower and may go through the exchangers.

The vapors coming from the separator undergo a fractionation in the primary tower. The condensed products fall into the accumulator and the vapors escape from the heads of the primary tower and pass into the secondary tower. The condensate falls in a compartment on the right, which is provided with a regulator. The vapors traverse the upper section of the secondary tower, called the debutanizing section, where the vapors of the light essence and the gas are separated from the heavy essence. The vapors then pass through a cooler and a condenser arranged in series.

The light essence and the gas pass into a container called the light essence tank. An internal partition assures the separation of the essence from water and impurities. Part of the essence thus obtained is pumped to storage and is used in part as a reflux at the top of the secondary tower. The impurities and the water are sent to the sewer.

The temperature at the top of the secondary tower is regulated automatically by the reflux pumps. The gas which escapes from the tank is sent to the gas works, passing through the regulator which automatically regulates the pressure throughout the entire unit.

The heavy essence is collected in the lower part of the debutanizing section and is sent to the revaporizer for heavy essence where it is rectified by steam injection. The heavy essence is sent from the bottom of the revaporizer through a cooler to storage.

The condensate from the bottom of the secondary tower is pumped from the right-hand compartment by the reheating pump into the reheating section of the furnace and on issuing from it may be sent either to the left-hand compartment or to the accumulator. The level regulator acts on the recycling pump which sends the excess from the left-hand compartment to the accumulator. This oil, augmented by feeding with the first products, forms what is called "total feed." The gas oil passes through a

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"La Cite de la Petite Compagne" Cottages in the workers village near Port Jerome Refinery.

lisses, dans la zone de convection, et 38 tubes lisses, dans la zone de radiation.

L'équipement du four comporte, comme pour le précédent, 6 brûleurs complétés par 6 moufles percés d'ouvertures. Il est également prévu une circulation d'air froid sous la sole.

2—**Colonne sous vide.**—Cette colonne cylindrique verticale, de plus de 24 m. de hauteur totale, a un diamètre d'environ 2 mètres à la partie inférieure, haute elle-même d'environ 5 mètres, et un diamètre de plus de 5 mètres à la partie supérieure, sur 19 mètres de haut.

Elle comporte en tout 21 plateaux pourvus de calottes.

Comme la tour atmosphérique, la tour sous vide est divisée en plusieurs sections de revaporisation. Elle est également munie de tiroirs de soutirage.

3—**Réservoirs de Réception.**—Tous les réservoirs de réception de soutirage sont reliés au haut de la tour par une ligne commune d'équilibre.

Pour la production du vide, l'installation comporte des condenseurs barométriques à jet avec éjecteurs à deux étages.

La pression absolue dans les condenseurs barométriques sera de 30 mm. de mercure.

Condensation et Recuperation

1—**Etage atmosphérique.**—Les produits de tête sont condensés dans un condenseur à 2 sections, la première utilisant le pétrole brut, la deuxième utilisant de l'eau.

Les soutirages sont refroidis dans des réfrigérants cylindriques, horizontaux, du type commercial à eau, l'eau circulant dans le tube en sens inverse du produit à refroidir.

2—**Etage sous vide.**—Les produits de tête sont condensés dans un condenseur utilisant le pétrole brut. La condensation est terminée par un condenseur à eau.

Les soutirages sont refroidis par des réfrigérants à eau du type ordinaire. Le réfrigérant du dernier soutirage est en série avec un échangeur servant au réchauffage du pétrole brut.

Les résidus sont refroidis dans deux échangeurs à eau. Il existe, en outre, un réfrigérant de secours constitué par un serpentin placé dans un bac.

A la sortie de la tour sous vide, on recueille comme produits de tête, du gas oil, ensuite les distillats lubrifiants et un résidu au fond de la tour.

Les deux parties de chaque "pipe still" peuvent marcher séparément.

La capacité de chaque unité est d'environ 1.500 m³ par jour.

La Raffinerie de Port-Jérôme devant traiter au moins deux pétroles bruts afin de pouvoir fabriquer les différentes catégories de produits dont ses sociétés associées ont l'écoulement, il s'ensuit que chaque batterie sera affectée à un pétrole brut spécial.

Aux deux batteries de première distillation correspondent des réservoirs de réception de 12 m. 20 de diamètre et de 12 m 92 de hauteur (40′ x 42′). Les réservoirs destinés à la réception des produits les plus volatils sont munis de toits flottants du type Wiggins, comme les réservoirs de pétrole brut.

Batteries de Cracking

EN RAISON de l'importance du tonnage d'essence à fabriquer par la S.F.A.R., cette société a dû prévoir une installation adéquate pour le craquage de ses gas oil et résidus.

Elle a, en conséquence, construit trois batteries de cracking, du type connu sous la désignation "Tube and Tank" (70 Kgs par cm² de pression) (1.000 lbs. per sq. inch.) chaque batterie comportant essentiellement un four, dont le faisceau tubulaire se divise en section de réchauffage, section de radiation, section de convection. Ce four est chauffé au moyen de 10 brûleurs pouvant fonctionner soit au mazout, soit au gaz.

La chambre de réaction est en acier forgé, d'une seule pièce, verticale, de 15 cm. d'épaisseur, m 50 de diamètre intérieur et 14 m. de hauteur, d'un poids supérieur à 100 tonnes. Elle est essayée à une pression de 210 atmosphères et est prévue pour une pression de fonctionnement de 70 atmosphères. Le séparateur mesure 3 m. de diamètre par 9 m. de hauteur. Sa pression de service est de 7 kgs. 7, à une température d'environ 425°.

Chaque batterie comporte deux tours: Une tour primaire, fonctionnet sous une pression d'environ sept kilos, et divisée en deux parties (1) la partie inférieure qui, jouant le rôle d'accumulateur, ne comporte pas de plateaux, et (2) la partie supérieure, munie de huit plateaux de fractionnement et d'un serpentin de réchauffage du liquide à traiter placé au sommet de la tour. Une cheminée intérieure permet l'évacuation par la partie supérieure des gaz en provenance de la partie inférieure. Une tour secondaire fonctionnet également sous une pression de sept kilos et est composée de deux séries de plateaux de fractionnement, séparées par un serpentin de préchauffage du liquide à traiter. Le fond de la tour est divisé en deux parties par une cloison verticale, l'une de ces parties étant munie d'un régulateur de niveau. L'installation est complétée par toutes les pompes d'alimentation, les échangeurs et condenseurs couramment employés.

Chaque batterie a une capacité variant entre 18.000 et 32 000 litres à l'heure, suivant la nature du produit à craquer.

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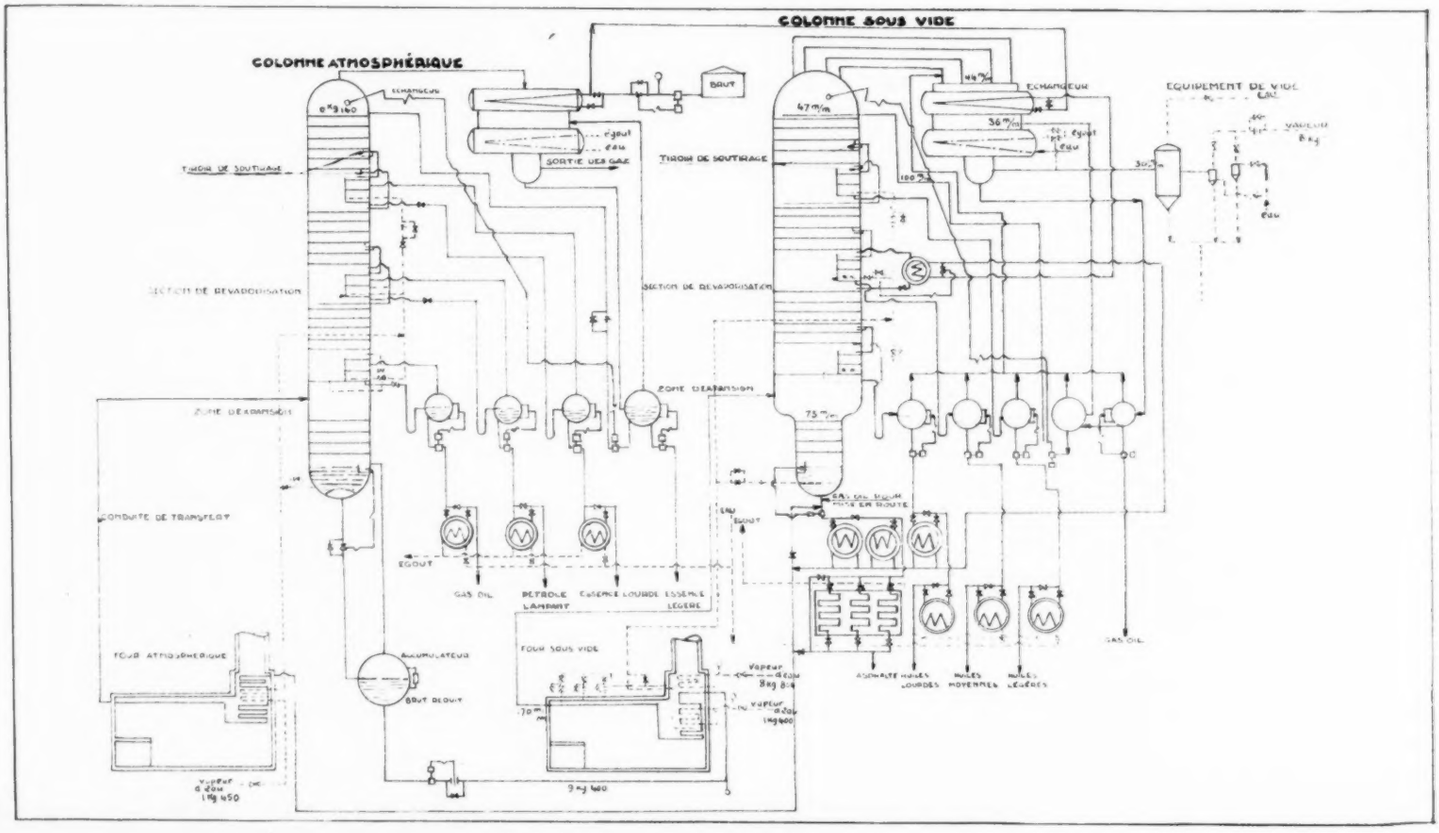

Unite de Première Distillation. Primary distillation unit at the Standard Franco-Americaine Refinery, Port Jerome.

cooler to storage. The tar runs from the bottom of the separator either into a tar revaporizer or to one of the three tar pumps.

A steam injector and interior baffles assure the rectification of the tar in the revaporizer. The tar which deposits on the bottom of the revaporizer is pumped by one or other of the tar pumps through two coolers either to storage or is used as a reflux at the entrance of the separator. The tar head products pass through a cooler and enter a tank where the gas is separated. The gas is sent to the gas works and the condensates are pumped by two pumps, the output of which is regulated by a level regulator in the tank. These condensates are used as a reflux in the separator, in the tar revaporizer, and in the accumulator.

Process of Refining

THE elements which enter into the composition of the finished essence are: (1) the heavy distillate coming from the cracking operation; (2) the essence from the first distillation skimmed from the crude; (3) the stabilized light essence coming from the light fraction of the cracked distillate and liquid recovered from the refinery gas.

The essences are refined by the classic sulphuric acid method, but the difficulties of its application to the light fraction and the side reactions which are undesirable from the standpoint of other specifications, such as the anti-knock quality, limit its application to the heavy distillate.

This heavy distillate undergoes a sulphuric acid treatment in a first unit of five decantation tanks. The acid, which is distributed by means of a blow-up, is applied in two successive portions in acid mixers followed by treatment in contact columns and the decanters. The treated distillate is then washed with water and neutralized with soda. After refining the heavy distillate must be redistilled and the distillation products are then mixed with the essence from the first distillation to be treated with plumbite of soda.

The operation is begun by a soda wash, the object of which is to neutralize the organic acids, to precipitate hydrogen sulphide, and partially to sweeten the essence.

The mixture of crude essence and soda arrives in the first decanter. The crude essence which has been treated with soda is then treated with plumbite in the presence of sulphured oil. The mixture is settled in a second decanter. The essence thus treated is washed with water and settled in a third reservoir. The products thus obtained are mixed in due proportions with stabilized light essence coming from the refinery gas-stripping station which has undergone a simple washing with soda.

The installation for refining the essences, aside from the refining equipment properly so-called, comprises all accessories such as storage tanks, pumps and installation for recovering weak acids.

As already mentioned the heavy essence coming from the cracking operation is treated with sulphuric acid. The necessary complement of this treatment is redistillation which, through separation of the heaviest fractions of the distillate, eliminates the undesirable products which the chemical treatment has concentrated in this heavy fraction, and likewise the heavy hydrocarbons produced by a secondary polymerizing reaction in the presence of sulphuric acid.

The batteries serving for the new distillation of the essences consist principally of a feed pump of the centrifugal type operated by an electric motor which takes the heavy essences to be redistilled from the receiving reservoir and passes them into the heat exchangers. Here the essence becomes heated in its passage through the exchangers, taking heat from the vapor of the product which has been vaporized in the distilling tower, which it cools.

The mixture of liquid and vapor on leaving the exchanger passes into the feed vaporizer. The source of heat in this vaporizer is steam. The mixture of liquid and essence traverses the tubes from bottom to top whereas the vapor circulates countercurrently through the shell from top to bottom.

On passing from the vaporizer the mixture of liquid and essence vapors is sent to the fractionating tower. This tower comprises an upper and a lower part, separated by a steam vaporizer of the horizontal type.

The liquid which sprays on the upper and lower plates of the tower passes from one plate to the other through overflow tubes which are placed in alternate positions. The liquid which comes from the overflow of the lower plate of the upper part of the tower is distributed uniformly over the surface of the vaporizer.

The mixture of liquid and vapors intro-

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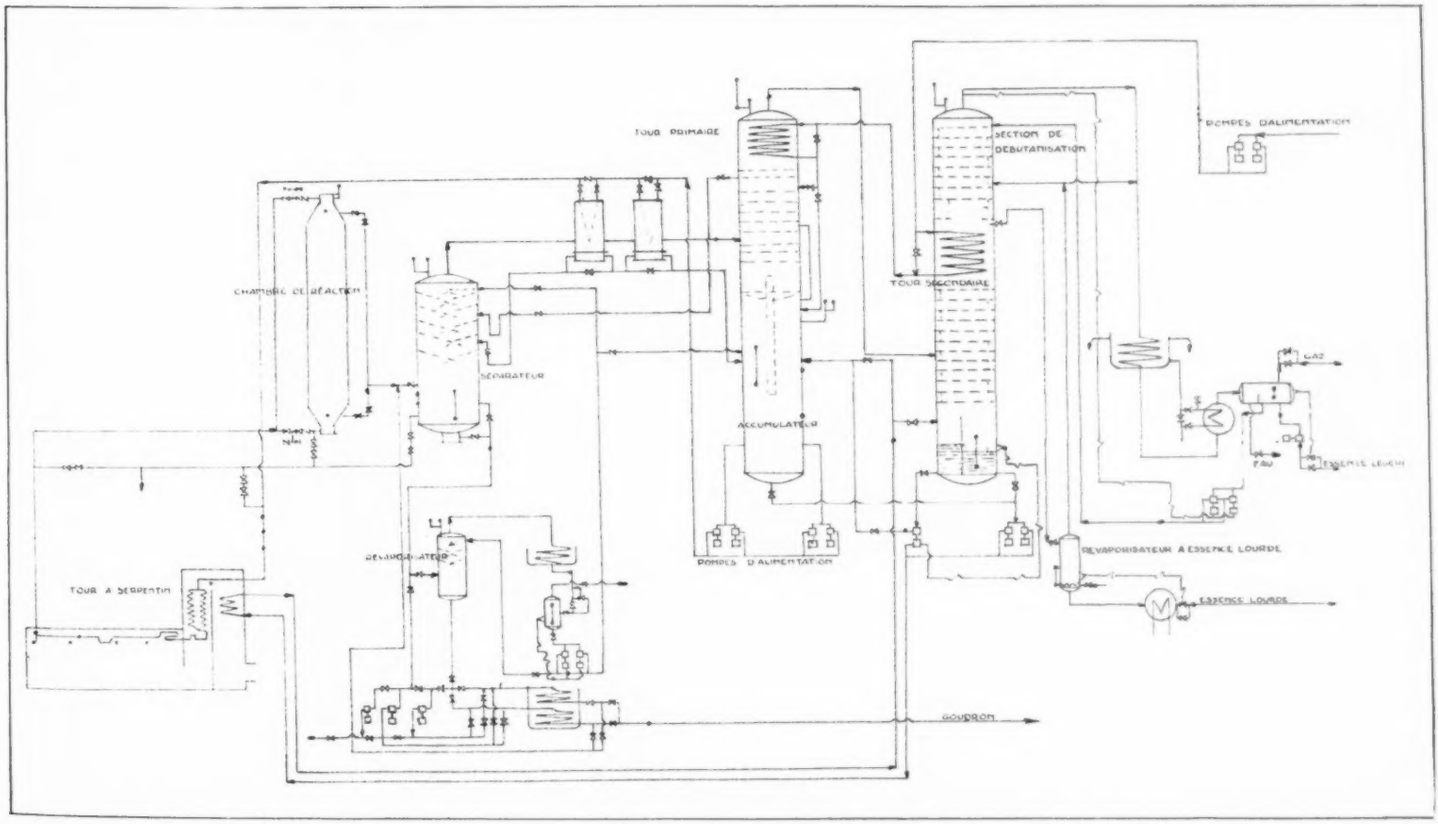

General flow sheet of cracking unit at the refinery of Standard Franco-Americaine, Port Jerome.

Lube pipe-stills under construction at the plant of Standard Franco-Americaine de Raffinage.

L'alimentation totale peut varier de 50 à 80.000 litres à l'heure, suivant la nature et les conditions du craquage.

Le liquide à traiter est pompé au moyen de pompes d'alimentation à vapeur vers le serpentin de la tour secondaire et, de là, vers le serpentin de préchauffage de la tour primaire. Ces deux serpentins peuvent être by-passés partiellement ou en totalité suivant le préchauffage désiré. Le liquide ainsi préchauffé passe dans l'accumulateur.

Deux pompes alternatives à plongeurs, appelées "pompes d'alimentation totale" refoulent le liquide contenu dans l'accumulateur, à la température de 300° sous 100 kg/cm² de pression environ, vers le faisceau tubulaire du four. De ces deux pompes, l'une est actionnée par moteur électrique, et l'autre est à vapeur.

Dans la chambre de réaction s'effectue le cracking en phase liquide. Ce liquide séjourne un certain temps sous la pression de 50 à 70 Kgs dans la chambre de réaction, à la sortie de laquelle les produits craqués subissent une détente (50–70 Kgs à 10–15 Kgs) et entrent dans le séparateur à goudron.

Dans le séparateur, le goudron liquide et les vapeurs de goudron condensées se déposent au fond tandis que les vapeurs vont dans la tour primaire en traversant éventuellement les échangeurs.

La température dans le séparateur sera réglée par trois reflux: (1) par du goudron: (2) par du brut préchauffé passant par la ligne de contact froid de la sortie du serpentin de la tour primaire au séparateur: (3) par le retour des produits de tête du goudron.

Les vapeurs venant du séparateur subissent un fractionnement dans la tour primaire. Les parties condensées descendent dans l'accumulateur et les vapeurs s'échappent du haut de la tour primaire et passent dans la tour secondaire. Le condensat retombe dans le compartiment de droite, muni du régulateur. Les vapeurs traversent la section supérieure de la tour secondaire appelée section de débutanisation où les vapeurs de l'essence légère et les gaz se séparent de l'essence lourde. Les vapeurs passent ensuite par un réfrigérant et un condenseur disposés en série.

L'essence légère et les gaz vont dans un ballon appelé "ballon à essence légère." Une cloison intérieure assure la séparation de l'essence, de l'eau et des impuretés. L'essence légère ainsi obtenue est pompée vers le stockage, d'une part, et comme reflux au sommet de la tour secondaire, d'autre part. Les impuretés et l'eau sont envoyées aux égoûts.

La température au haut de la tour secondaire est réglée automatiquement par les pompes de reflux. Les gaz s'échappant du ballon vont à l'usine à gaz en passant par un régulateur automatique qui règle la pression dans toute l'unité.

L'essence lourde est recueillie à la partie inférieure de la section de débutanisation et envoyée dans le revaporisateur à essence lourde, où une injection de vapeur permet sa rectification. L'essence lourde est envoyée du fond du revaporisateur, à travers un réfrigérant, au stockage.

Le condensat du fond de la tour secondaire est pompé du compartiment de droite par les pompes de réchauffage dans la section de rechauffage du four, et, à la sortie, peut être envoyé, soit dans le compartiment de gauche, soit dans l'accumulateur. Le régulateur de niveau agit sur la pompe de recyclage qui renvoie le trop plein du compartiment de gauche dans l'accumulateur.

Cette huile, ajoutée à l'alimentation en produits vierges, forme ce que l'on appelle "l'alimentation totale."

Le gas oil se trouvant dans le compartiment de gauche s'écoule, par différence de pression, à travers un refrigérant, vers le stockage.

Le goudron s'écoule, du fond du séparateur, soit dans un revaporisateur à goudron, soit vers l'une des trois pompes à goudron.

Une injection de vapeur et des chicanes intérieures assurent la rectification du goudron dans le revaporisateur. Le goudron qui se dépose au fond du revaporisateur est pompé par la ou les pompes à goudron, à travers deux réfrigérants, soit vers le stockage, soit comme reflux à l'entrée du séparateur. Les produits de tête du goudron passent à travers un réfrigérant et entrent dans le ballon à produits de tête du goudron où se fait la séparation des gaz et des parties condensées. Les gaz sont envoyés à l'usine à gaz et les condensats sont pompés par deux pompes dont le débit est réglé par un régulateur de niveau dans le ballon. Ces condensats sont utilisés comme reflux dans le séparateur, dans le revaporisateur à goudron. et dans l'accumulateur.

Raffinage des Essences

LES ÉLÉMENTS qui entrent dans la composition de l'essence terminée sont: (1) le distillat lourd, provenant de l'opération de cracking; (2) l'essence de première distillation, fraction naturelle du brut; (3) l'essence légère stabilisée, provenant de la fraction légère du distillat craqué et de la récupération des gaz de raffinerie.

Le raffinage des essences sera effectué au moyen du procédé classique à l'acide sulfurique. Cependant, les difficultés de son application aux fractions légères et les réactions secondaires indésirables au point de vue d'autres spécifications, comme le pouvoir antidétonant, en ont fait limiter l'emploi au seul distillat lourd.

Ce distillat lourd subit donc le traitement à l'acide sulfurique dans une première unité de cinq réservoirs de décantation. L'acide distribué par monte-jus est appliqué en deux fractions successives dans des mélangeurs à acide, suivis de colonnes de contact et de décanteurs. Le distillat traité est ensuite lavé à l'eau, puis neutralisé à la soude.

Le distillat lourd, après raffinage, doit être redistillé et les produits de distillation sont ensuite mélangés à l'essence de première distillation pour être traités au plombite de soude.

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duced into the tower is separated by distillation into a liquid fraction, consisting of a very light gas oil, which passes toward the lower part, and a vapor fraction which escapes at the upper part of the tower, and from there passes into heat exchangers where it is cooled and begins to condense on contact with the feed.

The cooling is effected by water in a horizontal tube bundle condenser where the condensation is finished. From the final condenser the condensed products are sent to a recovery tank provided at one end with a sump where the water separates from the essence by difference in gravity. The essence is sent to storage by means of a pump the output of which is regulated by level controller. The installation is so constructed that a part of the essence can be sent to the top of the tower as a reflux for regulating the temperature.

As regards the liquid fraction of the mixture introduced into the tower, which has collected in the lower part, it is subjected at the bottom of the tower to a steam injection the object of which is a revaporization of the entrained light products.

This liquid portion is taken by a pump at the bottom of the tower and sent to the storage reservoir; the output of this pump, as in the case of the essence pump, is regulated by a level regulator which commands a valve situated on the steam line of the pump.

Refining the Oil

THE lubricating distillates which come from the distillation of the various crude oils must be subjected to different operations, according to their destination, before being redistilled. These operations, to the number of three, are carried out or not, according to the characteristics of the products to be obtained.

The objective of the first operation is the chemical refining of the oil distillates. If, as is sometimes the case, it is necessary to refine chemically with sulphuric acid, arrangements have been made at the Port Jerome refinery for refining by selective solvents.

When a distillate is put in contact with a solvent and the mixture allowed to stand for a time two layers are formed; an upper layer comprising a small quantity of the solvent in solution in the oil and a lower layer in which the oil is in solution in the solvent. When these two layers are separated and distilled they give, after elimination of the solvent, two products: the "refinate" coming from the upper layer; the "extract" coming from the lower layer.

The refinate, freed from all its undesirable constituents such as unsaturated or aromatic hydrocarbons and sulphur compounds which pass into the extract, is then an oil of good quality.

For certain lubricating oils, especially for certain cylinder oils, and motor oil, there has been provided an installation for deparaffining. It consists of De Laval centrifugals in which the mixture of oils to be deparaffined is treated with trichlorethylene. The mixture of oil and trichlorethylene generally used is composed of the respective proportions of 55 and 45 percent. This mixture is cooled in vertical tanks by the countercurrent system.

After deparaffining in the centrifugals, the solution of oil and trichlorethylene, freed from paraffin, is taken by the pump and redistilled for the separation of the two products. The oil, freed from paraffin and solvent, is the finished product. For refrigeration the refinery has two-stage ammonia compressors driven by electric motors.

In order to produce the different qualities of lubricating oil required by the French market, the Port Jerome refinery has a redistillation battery for the distillate in which are effected the various fractionations necessary.

When required, the redistillation is carried out after refining and before deparaffining and filtering. The redistillation battery comprises a pipe-still, a plate column, condensers, exchangers, pumps and accessories.

The plant for treating the gas consists in the main of equipment for the absorption and the recovery of the hydrocarbons contained in the gas and which may be returned to the essences. It also comprises a plant for the stabilization of the essences. These installations permit the production of butane and propane which, as appears from American experience, may find a place in the French market for domestic use and for industrial applications.

The incondensable gases coming from

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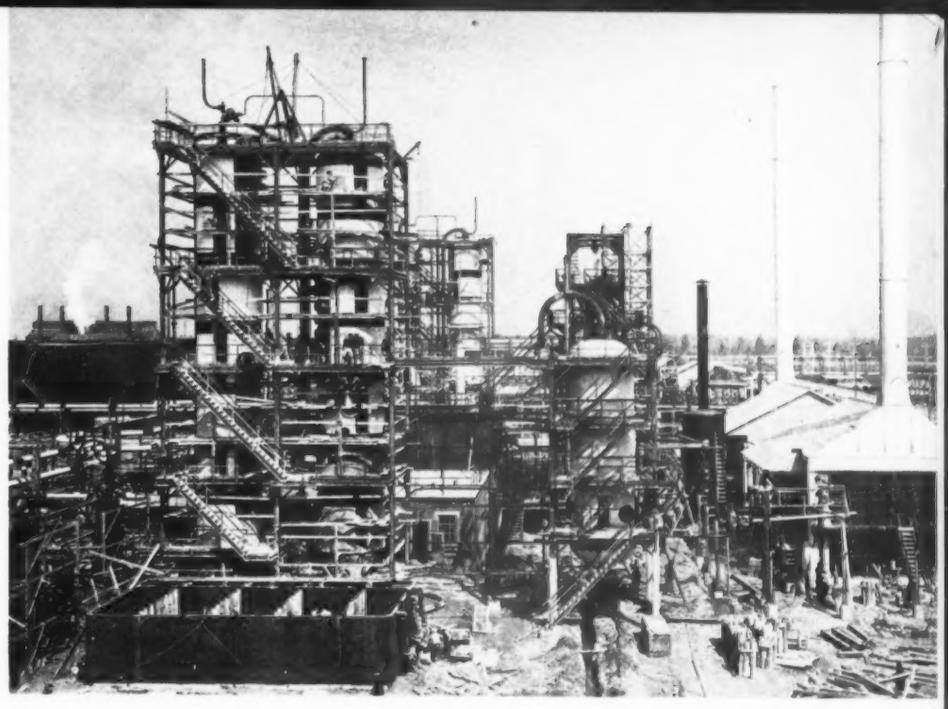
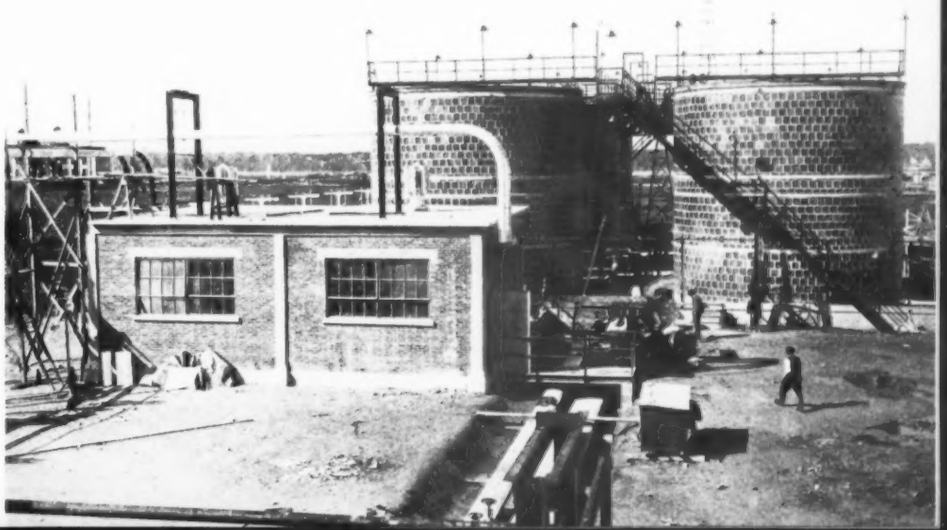


"Tube and Tank" cracking batteries at Port Jerome operating under 1,000 lbs. pressure.



Asphalt plant, pump house and tanks at Standard Franco-Americaine's Refinery.

Les produits ainsi obtenus, dont le raffinage est tel qu'ils doivent répondre aux spécifications en vigueur, sont mélangés à dues proportions à de l'essence légère stabilisée, provenant de l'usine de récupération des gaz de raffinerie et qui a subi un simple lavage à la soude.

L'installation de raffinage des essences comporte, en plus du matériel de raffinage proprement dit, tous les accessoires, tels que: pompes, réservoirs de stockage, installation pour la récupération des acides faibles, etc.

Distillation des Essences

COMME nous l'avons vu précédemment, l'essence lourde provenant de l'opération de craquage est traitée à l'acide sulfurique. Le complément nécessaire de ce traitement est la redistillation qui, en séparant les fractions les plus lourdes du distillat: (1) élimine les produits indésirables que le traitement chimique a concentrés dans cette fraction lourde; (2) élimine les hydrocarbures lourds produits par une réaction secondaire de polymérisation en présence de l'acide sulfurique.

La batterie servant à la redistillation des essences comporte principalement une pompe d'alimentation du type centrifuge, entraînée par un moteur électrique. qui prend les essences lourdes à redistiller dans le réservoir de recette pour les faire passer dans les échangeurs de chaleur.

L'essence ainsi refoulée s'échauffe en passant dans les échangeurs, empruntant la chaleur aux vapeurs du produit vaporisé dans la tour de distillation et qu'elle refroidit.

Le mélange de liquide et de vapeurs, en sortant de l'échangeur, passe ensuite à l vaporisateur d'alimentation. La source de chaleur dans ce vaporisateur est la vapeur. Ce type d'appareil est à faisceau tubulaire vertical. Le mélange de liquide et de vapeurs d'essence traverse les tubes de bas en haut alors que la vapeur circule à contre-courant, en traversant l'enveloppe de haut en bas.

A sa sortie du vaporisateur, le mélange de liquide et de vapeurs d'essence est dirigé vers la tour de fractionnement. Cette tour comporte une partie supérieure et une partie inférieure, séparées par un vaporisateur à vapeur, du type horizontal.

Le liquide qui ruisselle sur les plateaux des parties inférieure et supérieure de la tour, passe d'un plateau à l'autre dans des tubes de trop plein, dont les positions sont alternées. Le liquide en provenance des trop pleins du plateau inférieur de la partie supérieure de la tour est distribué uniformément sur la surface du vaporisateur.

Le mélange de liquide et de vapeurs introduit dans la tour se sépare par distillation en une fraction liquide, constituée par un gas oil très léger, qui se rend dans la partie inférieure et une fraction de vapeurs qui s'échappe au sommet de la partie supérieure de la tour pour passer, de là, dans les échangeurs de chaleur où elle se refroidit et subit un début de condensation au contact de l'alimentation.

C'est dans un condenseur à faisceau tubulaire horizontal et où le refroidissement est effectué au moyen d'eau que s'achève la condensation.

Du condenseur final, les produits condensés se rendent à un ballon de récupération, muni à son extrêmité d'un puisard où l'eau contenue se sépare de l'essence par différence de densité.

L'essence est envoyée au stockage au moyen d'une pompe, dont le débit est réglé par un contrôleur de niveau.

L'installation est telle qu'elle permet de renvoyer au sommet de la tour une partie de l'essence, sous forme de reflux, pour y régler la température.

Quant à la fraction liquide du mélange introduite dans la tour et recueillie dans la partie inférieure, elle est soumise dans le fond de la tour à une injection de vapeur, qui a pour but la revaporisation des produits légers entraînés.

Cette partie liquide est reprise par une pompe dans le fond de la tour et envoyée au réservoir de stockage, le débit de la pompe étant, comme pour l'essence, réglé par un régulateur de niveau, commandant l'ouverture d'une vanne située sur l'admission de la vapeur à la pompe.

Raffinage des Huiles

LES distillats de graissage, qui proviennent de la distillation des divers pétroles bruts, doivent être soumis à différentes opérations, suivant leur destination, avant d'être redistillés à nouveau. Ces opérations, au nombre de trois, s'appliquent ou non, suivant les caractéristiques des produits à obtenir.

La première a pour but le raffinage chimique des distillats d'huile. Si, dans certains cas, on est encore obligé d'utiliser le raffinage chimique à l'acide sulfurique, il a été prévu pour la Raffinerie de Port-Jérôme le raffinage par solvants sélectifs.

Quand on met en contact un distillat avec un solvant, on constate, après avoir laissé reposer le mélange formé, la présence de deux couches: une couche supérieure. comportant une faible quantité de solvant en solution dans l'huile, et une couche inférieure, dans laquelle l'huile est en solution dans le solvant. La séparation de ces deux couches, suivie de leur distillation, donne, après élimination du solvant, deux produits: (1) le "raffinat," provenant de la couche supérieure; (2) "l'extrait," provenant de la couche inférieure.

Le raffinat se trouve débarrassé de tous les constituants indésirables dans une huile de bonne qualité, tels que: hydrocarbures non saturés ou aromatiques et les composés du soufre, qui sont passés dans l'extrait.

Les installations en vue de cette opération comportent donc plusieurs parties: (1) d'abord, un appareil destiné à réaliser le contact entre le solvant et le distillat à traiter, et à effectuer la séparation des deux couches; (2) des installations de distillation pour récupérer le solvant de la solution qu'il forme avec l'extrait; (3) une installation de distillation du raffinat.

Il est à remarquer que, fréquemment, les huiles de graissage exposées à la lumière solaire changent de couleur au bout d'un certain temps. Ce temps est, en général, fonction pour une même huile du degré de raffinage auquel elle a été soumise. L'expérience ayant fait ressortir que la stabilité des huiles est améliorée en les traitant à la terre à foulon, une installation de ce type a été prévue.

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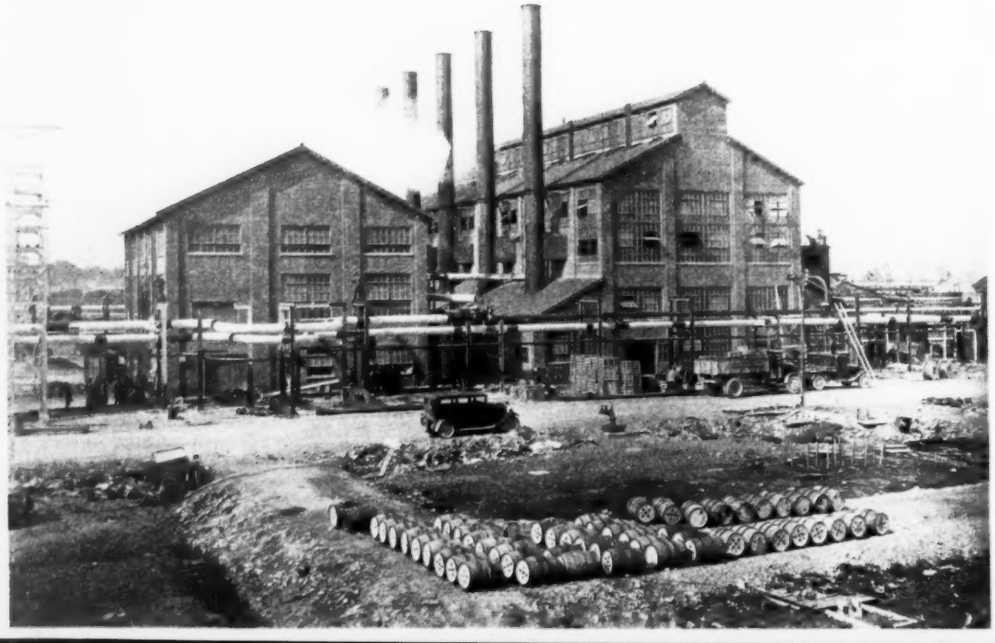
Central boiler and power houses of the Standard Franco-Americaine's Port Jerome Refinery.



these installations will serve for the present in part for heating the different distillation units and also in the central power house.

Bitumens, which are the heavy residues of the distillation operations, are stored in heated reservoirs which are externally insulated. Thence they are shipped either in barrels, tank cars, barges, or tank steamers.

For supplying the refinery with water there has been installed a pumping station to take water from the Seine; this pumping station includes fire pumps (hourly output about 1,000 cubic meters) and factory pumps (hourly output about 4,000 cubic meters). These are centrifugal pumps and the water they deliver is sent to a storage reservoir. For feeding the boilers the Seine water must be purified. The purification equipment is of the Phillips and Payne type.

All the waste waters of the refinery are sent by a network of channels to a separator having a surface of 2,500 square meters so that the water may be returned to the Seine completely freed from the hydrocarbons and the impurities which they contain.

The heat supply comprises a group of five Babcock & Wilcox boilers operated at 31 kilos which deliver their steam to a collector of 28 kilos which feeds two counter pressure turbines each of 4,000 H. P. These two turbines discharge in a collector at a pressure of about nine kilos. This second collector is also a part of a circuit and in its turn feeds a third turbine of 1,350 H. P. that serves all the refinery.

The refinery is provided with a large and completely equipped laboratory divided into several sections each of which is devoted to the control of operations on certain classes of production.

The general arrangement of the plant provides for moving the crude from tanks located north of the refinery through the different processes toward the Seine where provision is made for shipment of the finished products. These facilities include the usual loading racks for cars and wharves where non-inflammable products are loaded on river craft. Gasoline and kerosene are to be shipped principally from the foreport already established which is the first section of what is to be a complete port for large tankers.

One of the interesting and significant features of the Port Jerome refinery is the model village for workers, the "Cité de la Petite Compagne," which has been built at a distance of two kilometers from the plant. It consists of attractive villas built in the Norman style. The houses differ in details of design and color and therefore present an agreeable contrast in appearance. It is a very up-to-date town, being provided with water purifying and sewage system. All the houses are wired for electricity and will be supplied with gas from the refinery.

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La Raffinerie de S.F.A.R.

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Pour certaines huiles de graissage et notamment pour quelques huiles à cylindres, huiles moteurs, etc., on a prévu une installation de déparaffinage. Cette installation comprendra des centrifugeuses De Laval, dans lesquelles on traitera un mélange des huiles à déparaffiner avec du trichloréthylène.

Le mélange d'huile et de trichloréthylène généralement employé se compose respectivement d'environ 55% et 45%. Ce mélange est refroidi dans des cuves verticales d'après le système à contre-courant.

Après déparaffinage dans la centrifugeuse, la solution d'huile et de trichloréthylène, débarrassée de la paraffine, est reprise par des pompes et redistillée en vue de la séparation des deux produits. L'huile, débarrassée de la paraffine et du solvant, constitue un produit fini. Pour la production du froid, la raffinerie disposera de compresseurs à l'ammoniaque, à deux étages, actionnés par moteurs électriques.

Pour permettre la préparation de différentes qualités d'huiles de graissage requises par le marché français et qui, jusqu'à présent, étaient importées de différents points, la Raffinerie de Port-Jérôme disposera d'une batterie de redistillation des distillats, en vue de la préparation des divers fractionnements nécessaires.

La redistillation, lorsqu'elle est requise, s'opère après le raffinage et avant le déparaffinage et la filtration.

La batterie de redistillation est du type classique. Elle comporte un four, une colonne à plateaux, condenseurs, échangeurs, pompes et accessoires.

L'usine de traitement des gaz comprend principalement une installation d'absorption et de récupération des hydrocarbures contenus dans les gaz et qui peuvent à nouveau être introduits dans les essences. Elle comporte également une usine de stabilisation des essences ces installations permettront, de plus, la production de butane et de propane, qui semblent, à l'instar des Etats-Unis, devoir prendre place sur le marché français pour les besoins domestiques ainsi que pour les applications industrielles.

Les gaz incondensables, en provenance de ces installations serviront pour le moment et en partie au chauffage des différentes unités de distillation ainsi que de la centrale.

Les bitumes, résidus lourds des opérations de distillation, sont stockés dans des réservoirs réchauffés et calorifugés extérieurement. Ils sont, de là, expédiés soit en fûts, soit en wagons, soit encore en chalands ou tank-steamers.

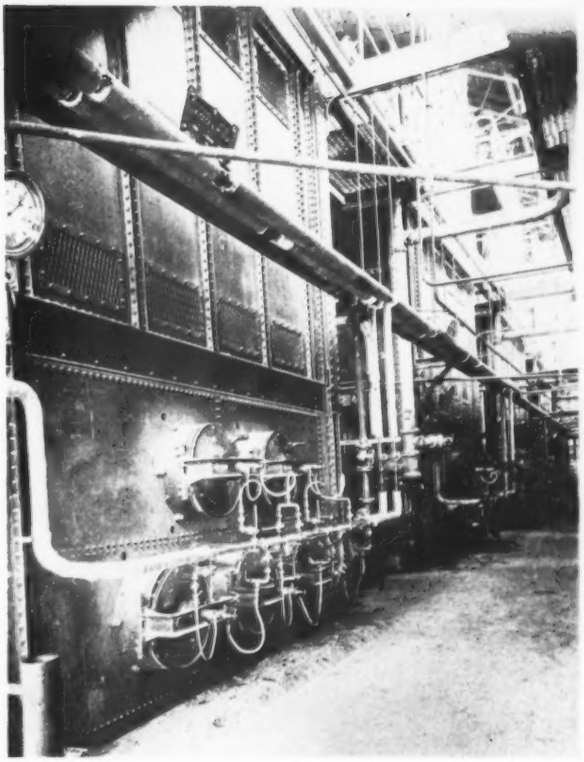
Pour l'alimentation en eau de la raffinerie, il a été prévu une station de pompage d'eau de Seine, comprenant des pompes à incendie (débit horaire: environ 1.000 m3) et des pompes pour l'usine (débit horaire: environ 4.000 m3). Ces pompes sont rotatives et, sur leur refoulement, est placée une dérivation, l'eau allant à un réservoir de stockage.

l Pour l'alimentation des chaudières 'eau de Seine doit être épurée. Le, matériel d'épuration fourni est du type Phillips & Pain.

Toutes les eaux résiduelles de la raffinerie sont dirigées, au moyen d'un important réseau d'égouts, vers un séparateur, d'une surface de 2.500 m2, qui permet de renvoyer à la Seine des eaux complètement débarrassées des hydrocarbures et impuretés qu'elles contenaient.

La central Thermique comprend un groupe de cinq chaudières Babcock & Wilcox, timbrées à 31 kilos, qui déversent leur vapeur dans un collecteur à 28 kilos, alimentant deux turbines à contre-pression de 4.000 C.V. chacune.

Ces deux turbines évacuent elles-mêmes



Interior view of boiler plant at Port Jerome showing battery of Babcock and Wilcox boilers.

dans un collecteur d'une pression d'environ 9 kilos. Ce deuxième collecteur, formant également circuit, alimente à son tour une troisième turbine de 1.350 C.V. et dessert toute la raffinerie.

Sur ce circuit viennent se greffer toutes les installations auxiliaires de la chaufferie, toutes les stations de pompes et toutes les prises de vapeur nécessaires aux groupes de distillation.

Enfin, tous les échappements des appareils auxiliaires sont recueillis dans un collecteur et servent au réchauffage de l'eau d'alimentation.

Les caractéristiques des chaudières sont les suivantes:

Timbre	31 kilos
Surchauffe	340°
Production vapeur heure	
moyenne	17 tonnes
maximum	20 tonnes
Température d'eau d'alimentation	110° C
Surface de chauffe	495 m2
Surface de chauffe:	
réchauffeur	177 m2
économiseur	205 m2

L'installation de chauffage comprend 5 brûleurs par chaudière. Deux chaudières ont été équipées principalement pour brûler les résidus de raffinage et toutes peuvent, à la fois, brûler comme combustible normal, du Fuel Oil Lourd et, éventuellement, du gaz incondensable de raffinage.

Elle comprend trois groupes turbo-alternateurs triphasés: deux à contre-pression de 3.000 kw., l'autre, à condensation, de 1.000 kw. Les caractéristiques des appareils sont les suivantes:

Fréquence	50 périodes
Tours minute	3.000
Facteur de puissance	0.8
Voltage: Régulateur de tension Brown.	

Les turbines sont du type combiné à action et à réaction. Les enroulements des alternateurs sont refroidis par un ventilateur à filtre Scam.

L'éclairage de l'Usine est assuré: pour les blocs (1) par des lampes sous globe de 110 volts; (2) par des projecteurs extérieurs étanches aux gaz; (3) par des lampes portatives: pour les rues, l'éclairage est assuré par des lampes dont les armatures sont fixées sur les pylônes des lignes aériennes.

Dans la zone dangereuse, des batteries de distillation et de cracking, les lignes aériennes ont été remplacées par des câbles armés enterrés. Un circuit de secours alimenté par une batterie d'accumulateurs permet d'assurer un éclairage partiel. En ce qui concerne l'alimentation des moteurs élëctriques, on a adopté, pour les moteurs de grande puissance, une tension de 3.000 volts, et pour ceux de faible puissance, une tension de 380 volts.

Les dimensions de l'usine ont conduit à prévoir des postes de transformation. Dans certaines parties de l'installation, il a été placé directement sur les lieux d'utilisation des transformateurs, destinés uniquement à l'alimentation des lampes baladeuses, sous la tension très réduite de 30 volts, afin d'assurer une sécurité parfaite du personnel.

On the groupé, dans le Bloc 4, les bureaux de la raffinerie, le bureau des douanes, le laboratoire ainsi que le bâtiment prévu pour le service médical. Ces bâtiments n'offrent rien de particulier, à l'exception du laboratoire, qui a été prévu très large et qui consiste en un vaste rez-de-chaussée surélevé comprenant différentes salles, chacune d'elles affectée plus spécialement aux opérations de contrôle de certains produits.

Parmi les services généraux, la raffinerie compte un atelier équipé avec toutes les machines-outils courantes et machines à fileter, permettant de procéder sur place aux réparations urgentes et modifications de faible importance. Enfin, à proximité de l'atelier, se trouve un magasin de stockage pour toutes les pièces de rechange et le matériel de consommation courante.

En se reportant au plan général de l'usine, on s'aperçoit que les huiles brutes, en provenance du Havre, sont stockées dans des réservoirs au nord de la raffinerie et que les différentes opérations auxquelles ces huiles sont soumises se font successivement en se rapprochant de la Seine, à proximité de laquelle se trouvent les parcs de stockage des produits finis.

Pour les expéditions des produits de la raffinerie, on disposera des rampes de chargement habituelles, en ce qui concerne les expéditions par wagons. Quant aux expéditions par chalands, ou par pétroliers, elles se feront, soit à l'appontement en Seine, pour les produits non-inflammables: gas oil, fuel oil, huiles de graissage, asphaltes, soit, pour les produits inflammables: essences et pétrole lampant, dans l'avant-port actuellement réalisé et qui constitue la première étape du port prévu dans l'avenir pour la réception des grands bateaux pétroliers.

Cite Ouvriere

L'EXPOSE ci-dessus a fait ressortir l'importance de la raffinerie réalisée par la S.F.A.R. Mais là ne s'est pas borné son activité. Il s'agissait, en effet, de pourvoir aulogement du nombreux personnel que devait requérir le bon fonctionnement de cette usine. Et c'est ainsi que, parallèlement à sa construction, s'est édifié, à deux kilomètres de là, la "Cite de la Petite Campagne."

Au visiteur, encore tout impressionné par les imposantes installations qu'il lui a été donné de voir, la cité offre le délassant spectacle de ses coquettes villas, conçues dans le style normand, différant entre elles par quelque détail de façade ou de disposition mais toutes de couleurs vives qui rendent plus éclatant le soleil qui les vient égayer.

Une véritable cité, avec ses larges avenues et ses nombreuses rues transversales, poussée là, à flanc de coteau, par la seule volonté d'une société, soucieuse de donner à son personnel un gîte à la fois agréable et confortable! A cet effet, elle a doté la cité d'une station d'épuration des eaux ainsi que d'un réseau d'adduction d'eau et d'un réseau d'égouts. Toutes les maisons possèdent déjà l'électricité et, plus tard, lorsque la raffinerie sera en plein rendement, elles disposeront également du gaz qu'elle leur fournira.

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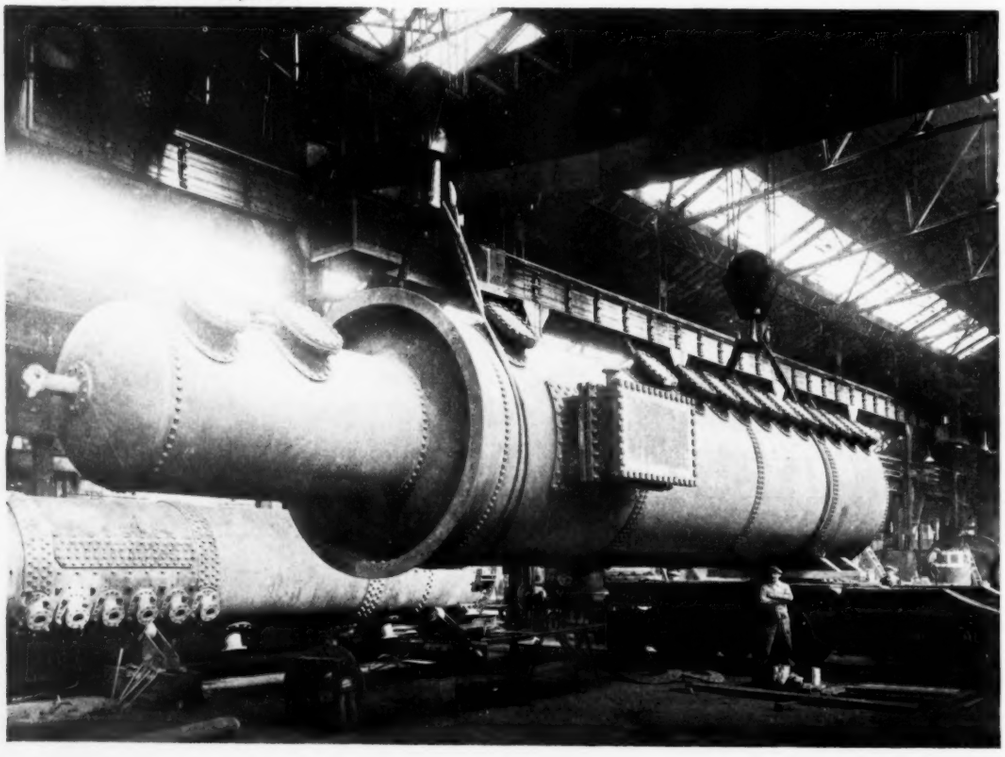
Tower built by Soc. Gen. Als.— Thom for Port Jerome Refinery.



Broad Construction Program Advances in France

National Policy of Encouragement to Domestic Refining Has Caused Country to Take Lead in Erection of New Plants.

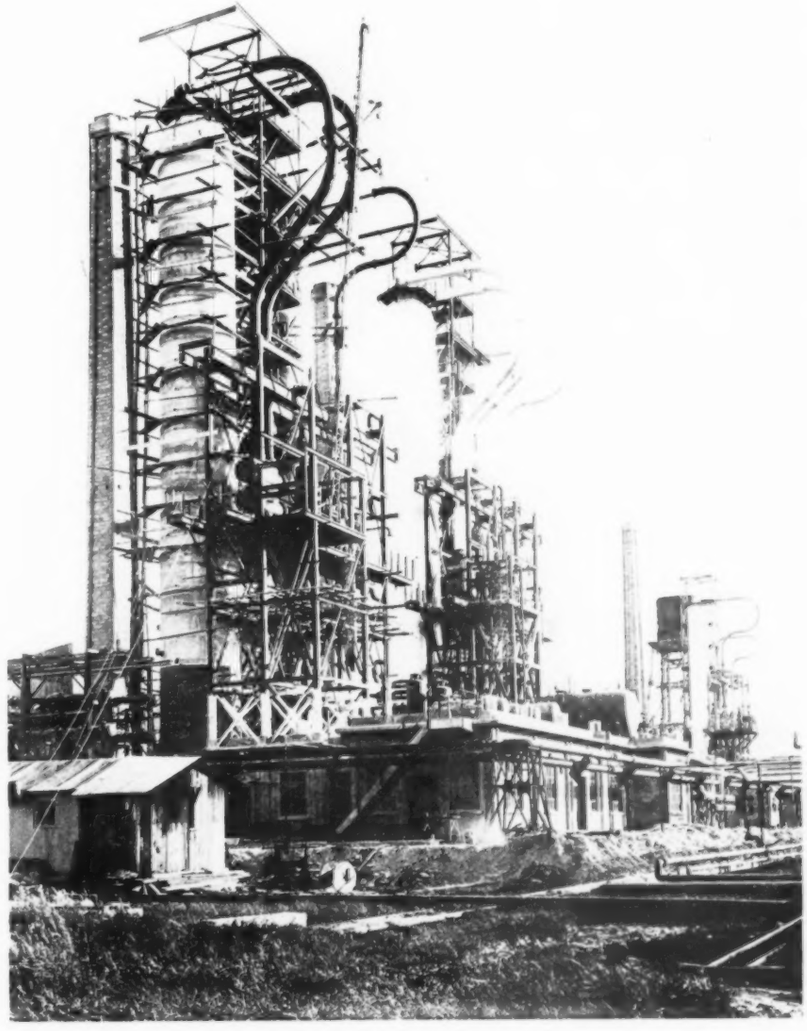
OWING to the policy followed by France for the past several years of replacing imports of petroleum products by the building up of a great refining industry within its borders that country has been, for the past two years at least, the scene of a greater amount of new construction than any other area of like extent. While the new plant of the Standard Franco-Americaine de Raffinage at Port Jerome is described in detail in a preceding article this is only one of a number of important refineries that have been brought nearly or quite to completion during the past year.

Directly adjacent to the site of the Standard's Port Jerome plant Raffineries de la Vacuum Oil Co. S. A. F. is completing a cracking and reforming installation that will handle over 2,300 bbl. per day of various crudes. The composite charge is to produce 1,390 bbl. of gasoline daily with an end-point of 400 deg. F. and an iso-octane rating of 70 by the C. F. R. research method. The stabilizer will produce 9–11 pounds Reid vapor pressure distillate.

At Frontignan, on the Rhone canal, near the Port of Sète, the Compagnie Industrielle des Pétroles, which is likewise affiliated with the Vacuum Oil Company, has completely modernized an early refinery, bringing it up to a capacity of 150,000 metric tons annually. Both these plants were constructed by the Compagnie Technique des Petroles from designs of the M. W. Kellogg Company and their cracking units are licensed under the patents of the Gasoline Products Company. At least 1,400 bbl. of 400 deg. F. endpoint gasoline will be produced. The rerun still will process 1,600 bbl. of pressure distillate per stream day.

The cracking and reforming unit has three cracking zones in separately fired pipe heaters. The heavier end of the topped crude and heavy recycle gas oil undergoes conversion in the primary cracking furnace, producing charging stock for the vapor phase furnace and reducing the residuum to the lowest gravity possible while maintaining the fuel oil specification. Fuel oil quality is controlled by fractionation in a fuel oil flash tower which is used to distill, by flashing at lower pressure, the cycle gas oil in the evaporator bottoms. The rerun still for the stabilized treated gasoline is a two-stage atmospheric vacuum unit for redistilling the gasoline at low temperatures. The towers have built-in tubular heating elements which supply the heat for distillation from either high pressure steam or hot gas oil from the cracking unit.

Two important refining projects executed by the Société Générale des Huiles de Petrole, a subsidiary of the Anglo-Persian Oil Company, are the plants at Lavera in the south of France and at Courchelettes, near Dunkerque on the Scarpe, close to the Belgian frontier. The Lavera plant, which is now about ready to begin refining, occupies an extensive site near Marseilles which was selected for its convenience in receiving and storing oil from the Persian fields. The refinery is designed with a view to possible expansion to a capacity of 2,450,000 bbl. At present it consists of a topping unit with a daily capacity of 8,000 bbl., composed of a pipe still and two condensing towers, one vacuum and one atmospheric; a Cross cracking unit with a capacity of 3,500 bbl. and a two stage rectifying column, atmospheric and



Distillation units installed by Foster-Wheeler Corporation at Vacuum Oil Company's Port Jerome refinery.

Aerial view of the new refinery of Cie. Francaise de Raffinage at Gonfreville.

vacuum, with a capacity of 2,100 bbl. A chemical refining plant deals with the residues from the distilling and cracking units.

An attractive feature of Lavera is the workers' village which has been built among the olive groves and pine woods some distance back from the sea. It includes 80 dwellings, a sports field, hospital and all modern hygienic installations.

Courchelettes has a longer history for it occupies the site of a refinery originally built in 1865. It was destroyed by the Germans during the world war, rebuilt between 1919 and 1922 and subsequently enlarged and modernized. It now has a capacity of 200,000 tons per year, covers an area of nearly 150 acres and employs 800 workmen. Crudes entering the plant are topped and passed on for integral refining. There are two first distillation units. Gases from topped crude are recuperated in a special plant. An installation for manufacturing butane has just been completed.

One of the most complete and elaborate refining plants yet erected is that of S. A. des Petroles Jupiter, a subsidiary of the Royal Dutch Company, which was officially dedicated early this year. It is located at Petit Couronne on the left bank of the Seine, 15 kilometers from Rouen. It occupies an area of 20,000 sq. meters and comprises 45 separate buildings besides the two villages for workmen.

Petit Couronne really comprises two refineries, one having an annual capacity of 1,400,000 bbl. dealing chiefly with Venezuelan crude and manufacturing essential products—gasoline, kerosene, lubricants, gas oil and asphalt. It is equipped with a distilling plant, two vacuum tube stills, a refining unit for white products, a redistilling plant and a plant for treating asphalt. The second installation completed last year, handles crudes from both the Dutch East Indies and from Venezuela. It has an annual capacity of 2,800,000 bbl. The refinery was constructed mainly by the Cie de Fives Lille under the direction of the company's technical staff.

Another newly completed property of S. A. des Petroles Jupiter is the Pauillac refinery, situated about 50 kilometers from Bordeaux on the River Gironde. It has an annual capacity of about 1,400,000 bbl. and the refinery is of the Edeleanu type, the first of its kind to be erected in France. Pauillac is also equipped with a pipe-still distillation unit and with plants for the manufacture of asphalt and the recuperation of gas.

Oldest of all refineries in France and the only one handling oil of domestic production, but brought thoroughly up-to-date by recent enlargement and reconstruction, is the plant of S. A. E. M. Pechelbronn in Alsace. It has an annual capacity of about 1,400,000 bbl. of which 511,000 bbl. was locally produced in 1932, the remainder of its crude supply being imported.

Pechelbronn is equipped with two topping plants, a Wolf-Carbürol cracking unit, a vacuum distillation unit, a paraffine wax plant, a redistillation plant and a chemical refining plant where sulphuric acid treatment is applied. The company's laboratory is organized to control finished products and to undertake research work.

New cracking plant of Cie des Produits Chimiques et Raffineries de Berre.

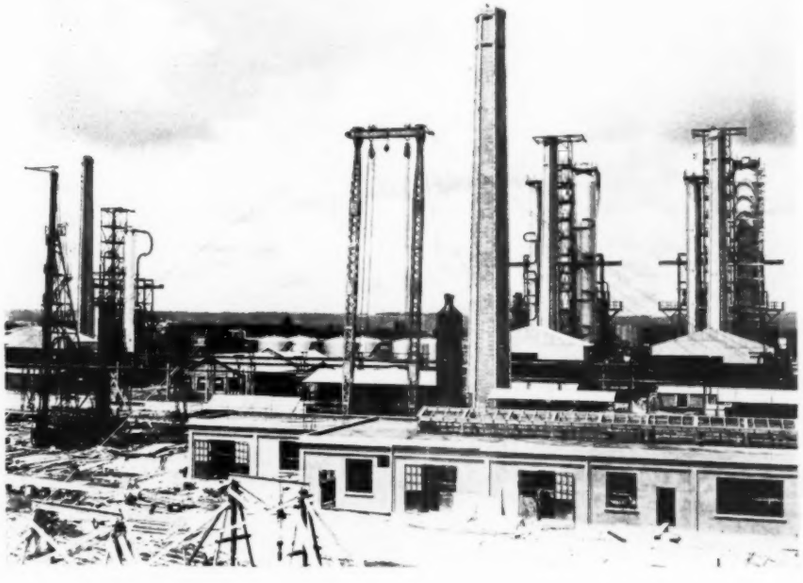
Storage farms of S. A. Lille Boumieres et Colombes at Marseilles, France.

Bec d'Ambes refinery of the Soc. des Raffineries de Petrole de Gironde occupies a picturesque site about 28 kilometers from Bordeaux on a tongue of land almost surrounded by water. The River Garonne flows along one side and the Dordogne on the other. The Texas Corporation owns a part interest in the refinery which operates mostly on American crude. The refinery has a license to import crude sufficient for the production of 1,136,800 bbl. of products annually but its actual capacity is somewhat larger. The equipment includes a first distillation plant with a daily capacity of 1,000 cu. meters, a Dubbs cracking unit, a Cross cracking unit, a rectifying and chemical refining installation, a unit for stabilizing gasoline and one for the recuperation of gases.

Another noteworthy addition to the roll of French refineries is that of Raffinerie du Nord at Dunerque erected by Soc. Petrofini du Nord (Belge de Petrole). This plant is equipped with a Winkler-Koch cracking unit of 1,400 bbl. daily capacity installed by A. F. Craig and Company.

Building operations on the Berre refinery of the Cie de Berre were begun in 1929 but the equipment originally installed was largely obsolete and has been replaced recently, bringing the refinery fully up-to-date. The company is licensed to import crude sufficient for the production of 1,561,000 bbl. of products and the affiliated company, S. La Toneline, has a license covering 378,000 bbl. The refinery is now equipped with two pipe-still units for treating crude, both fitted with pre-heaters, evaporators and fractionating towers. There are two vacuum tube still batteries for dealing with residues and a vacuum unit for manufacturing lubes. Last year a Cross cracking plant of 2,500 bbl. daily capacity was installed and a complete paraffine and asphalt plant has been erected.

View of distillation plant at Vacuum's Port Jerome Refinery taken from behind cracking units.



The small refinery of Donges was completed last year by Les Consummateurs de Petrole. It is located on the Loire, 16 kilometers east of St. Nazaire and is licensed to import sufficient crude to manufacture 140,000 bbl. of lubricating oil. Donges is equipped with a topping plant designed by the Foster Wheeler Company and erected under American engineering supervision. It has a total capacity of 1,000 bbl. daily and has been equipped to obtain a complete scale of lubricating oils.

One of the important recent additions to French refining facilities is the plant of the Cie. Française de Raffinage near Havre. The company is controlled by Cie. Française des Petroles in which the French government holds a large interest and the refinery was built with a view to handling oil from Iraq on completion of the pipeline now being built to the Mediterranean. Meanwhile the plant has been operating on crude from other sources, having inaugurated its activities early in the present year. Its initial capacity is 5,600,000 bbl. but it is expected that this will be enlarged to permit the handling of 10,500,000 bbl. annually.

Pipelines at Batum

Petroleum Refining in the Soviet Union

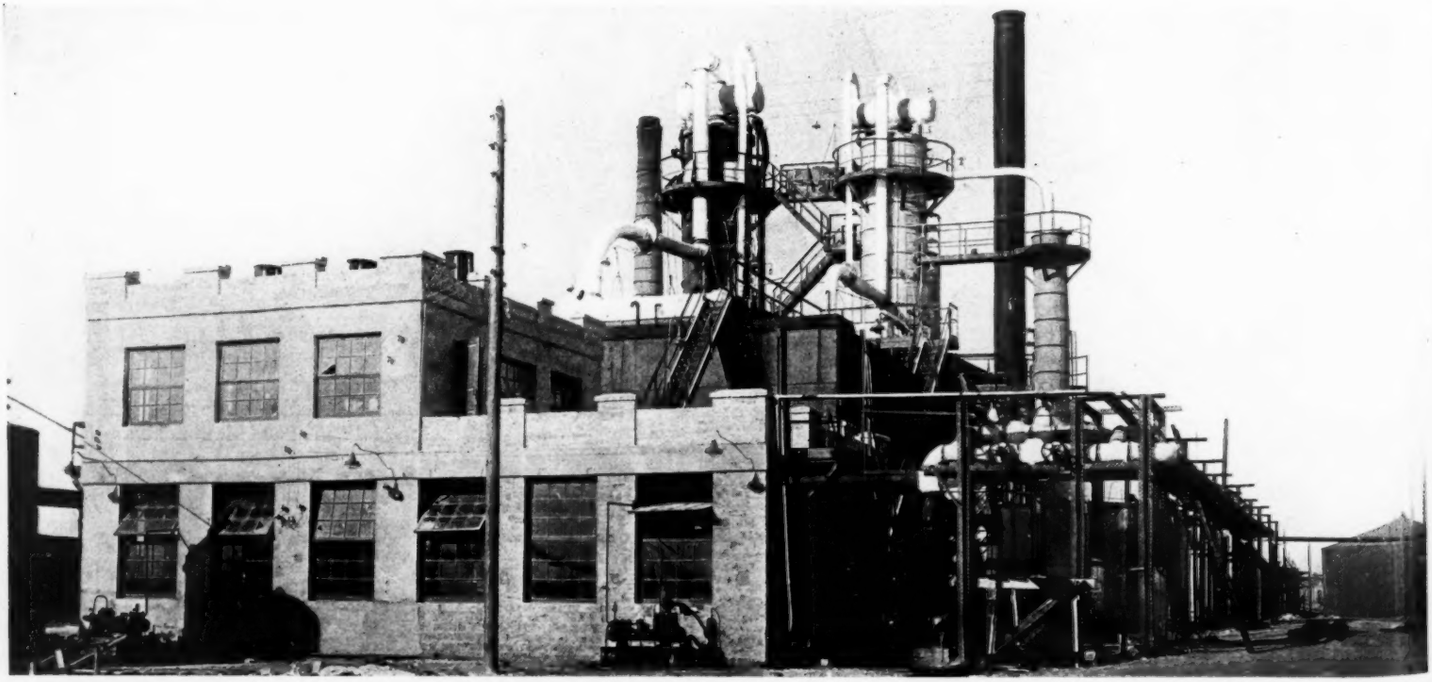
Following Construction of Foreign Built Plants Russians Are now Endeavoring to Meet Growing Requirements from Domestic Technical and Engineering Resources.

UNTIL recently Soviet Russia's refineries consisted mainly of shell stills, erected in pre-war years, for continuous operation in which the crude flowed from still to still under gradual heating and gradual evaporation and the vapors were directed to water condensers, on the top of which de-phlegmators were erected for rectification purposes. The shell stills yielded limited quantities of gasoline which had to be re-run and the main products were ligroin, kerosene and gasoil.

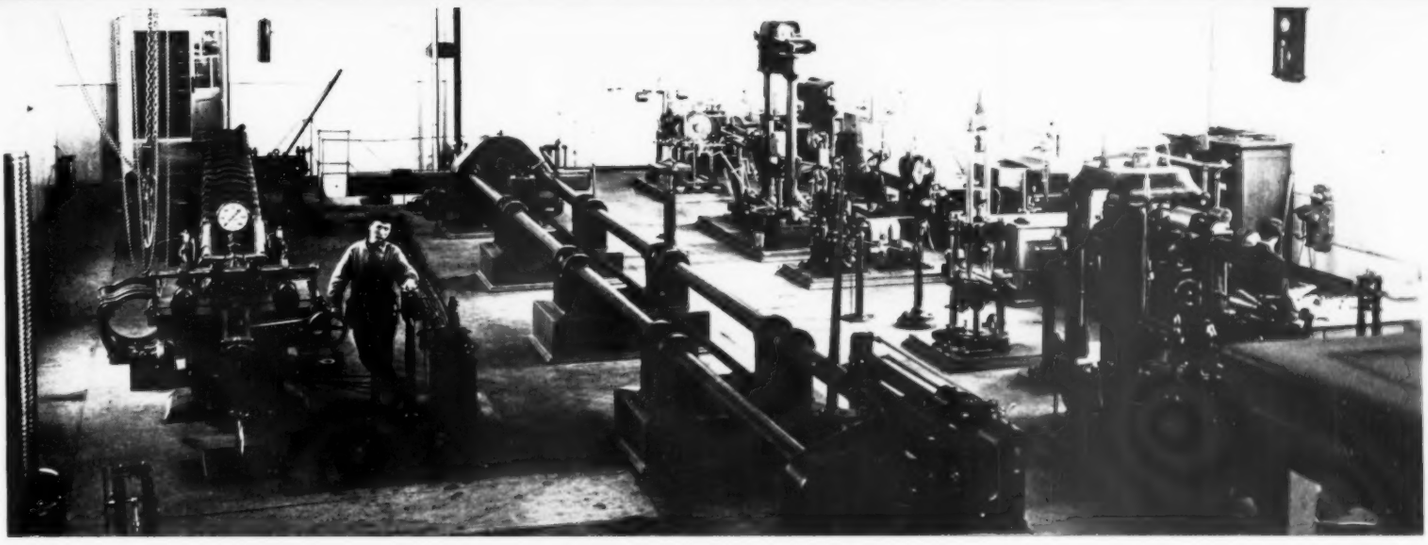
At the beginning of the Five Year Plan period in 1928 several new shell still units were erected of modern American type and design and pipe still installations were ordered first in Germany (Borman, Pintch and Wilke) and then in USA (Graver, Badger, Foster-Wheeler, Max Miller and Alco Products).

Since 1932 Soviet Russia has been building refinery equipment of domestic design, along the lines of American imported models, and for this purpose several machine shops at Baku, Grozni, Podolsk and at other points have been assigned to the oil industry. Progress in this direction is reported as slow since much of the equipment is unsuited to heavy duty and the operating personnel has been lacking in experience. The cracking equipment of domestic design evolved by Shukoff Kapelushnikoff in 1931 has also been employed.

Proximity of raw materials and convenience of export formerly were the main considerations determining the location of Soviet refineries. Today growing demands for home consumption which have increased from 15 percent of the total crude output in 1925 to an estimated almost 60 percent in 1933 are dictating the erection of refineries at main points of consumption. Another feature of domes-



General view of Graver pipe-still installation at Baku.



Mechanical shops of Azneft at Baku.

tic consumption is the change from oil for lighting, some lubrication and fuel to increased demands for white products and this has developed an interest in production of volatile products.

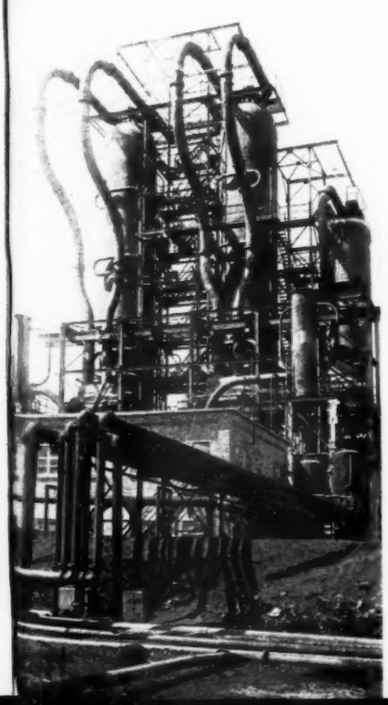
The refining capacities of Baku-Batum and Grozni-Tuapse have been stabilized and practically no more additions are under contemplation for these points. In future Baku crude will be carried for processing along the Volga river to Astrakhan, Saratoff, Samara, Gorki and Yaroslavl where refineries are under erection. Grozni crude will be carried to the Ukraine and refineries will be erected at Armavir, Rostoff at the Don basin and Moscow. (This decision has proved rather premature owing to the fact that Grozni oil fields do not yield at present sufficient crude to keep the refineries of Grozni and Tuapse running at full capacity.) Emba oil fields will supply the Ural Kuznetz basin, Kazakstan and Western Siberia with refineries at Orsk and other strategic points. Middle-asia crude is to be carried to the cotton belt, and Sakhalin crude oil will be carried to Khabarovsk and Vladivostok in the Far East.

At the beginning of 1928 the capacity of the Baku and Batum plants amounted to about 70 percent of the crude production of the Baku fields. During the period 1928–32 a total of about 63,000,000 bbl. annual capacity of shell and pipe stills and 10,000,000 bbl. of cracking were erected. The low figure of cracking at Baku-Batum is due to the decision to shift the processing of Baku crude along the Volga

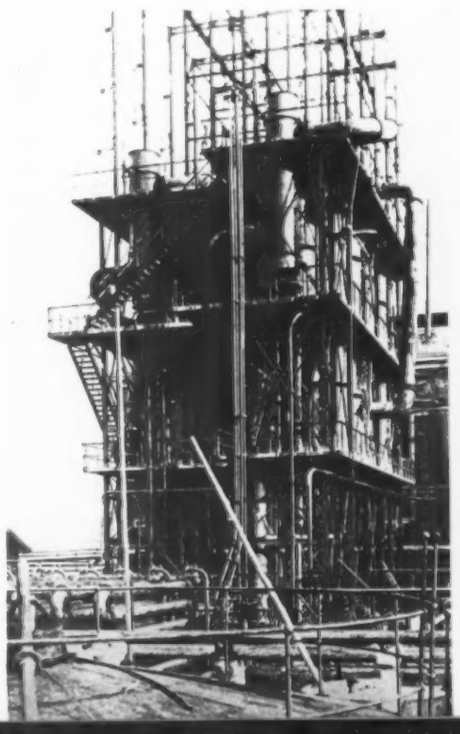
Refining Capacity Soviet Russia

Oil Trust and Location	No. of Plant Units	Annual Straight Run	Capacity in bbl. Lubeoil	Capacity in bbl. Cracking	Description
AZNEFT					
Baku	17	38,800,000			Shell stills in operation on 1.1.28
					New construction during Five Year Plan period
Baku	1	2,800,000			10 shell still battery
Baku	1	3,400,000			9 shell still battery
Baku	1	3,000,000			9 shell still battery
Baku	1	3,500,000			9 shell still battery
					Pipe still units
Baku	4	5,500,000			Domestic design
Baku	1	3,100,000			Wilke, Germany
Baku	1	1,800,000			Pintch, Germany
Baku	1	3,500,000			Graver Corp., USA.
Baku	3	8,900,000			Badger Corp., USA.
			19,800,000		
Baku	2	5,800,000			Foster-Wheeler
Baku	2		700,000		Pengu Gurevitch
Baku	6			3,800,000	2 Vickers, 2 double units Winkler Koch 2 Kapelushnikoff units
		80,100,000	20,500,000	3,800,000	
Batum	1	7,600,000			Shell still battery
Batum	4	13,800,000	1,400,000		2 Pipe stills Foster-Wheeler
					2 Domestic
Batum	5			6,200,000	Jenkins & Winkler Koch units
Total		101,500,000	21,900,000	10,000,000	
GROZNEFT					
Grozni	2	28,200,000	1,160,000		New and old shell still battery units
Grozni	1	2,650,000			Borman pipe still
Grozni	1	3,100,000			Pintch pipe still
Grozni	2	5,800,000			Jorgenson pipe still dom. des.
Grozni	1	5,450,000			Foster-Wheeler pipe st.
Grozni	1	4,000,000			Foster-Wheeler
Grozni	1	8,925,000			Badger
Grozni	2	6,450,000	3,800,000		Alco Products
Grozni	1	160,000			
Grozni	7			10,100,000	Vickers, Jenkins and Winkle Koch units
		64,735,000	4,960,000	10,100,000	
Tuapse	1	8,350,000			Shell still battery
Tuapse	2	2,250,000			Borman pipe still
Tuapse	2			2,550,000	Winkler Koch units
Makhatch Kala	1	1,550,000			Shell still
		79,085,000	4,960,000	12,650,000	
MAIKOP					
Krasnodar	1	1,505,000			Shell still
Krasnodar	1	3,080,000			Pipe still
		4,585,000			
NEFTEZAVODI					
Konstantinovka	3	2,725,000			Shell still
Varinsk	1	1,775,000			Shell still
Vladimir	1	360,000			Shell still
Leningrad	1	340,000			Shell still
Santo Chimion	3	560,000			Shell still
Yaroslavl	1	360,000			Shell still
Chussovo	1	230,000			Pipe still
		6,350,000			
Grand Total		191,520,000	26,860,000	22,650,000	

Badger kerosene and gasoline pipestill.



Foster Wheeler atmospheric-vacuum rectification towers.



Petroleum Cracking—Methods and Progress

Developments Which Have Made Possible Modern Large Scale Motor Fuel Production. Characteristic Features of Various Processes.

THE preeminent influence in the evolution of the petroleum refining industry from its inception to its present advanced state has been the world's ever-increasing demand for gasoline. Inasmuch as the crude petroleum found in nature contains an average of only approximately one fourth gasoline, increased requirements necessitate the conversion of a part of the remaining heavier portion into this product. The method of accomplishing this end, wherein heavy petroleum oils are treated to effect a chemical conversion of at least a portion into gasoline is "cracking." Processes for carrying on cracking have occupied an increasingly important position in the petroleum industry, and it is by virtue of their use that the gasoline requirements of the world are being easily met from available natural petroleum resources without excessive cost to consumer. An understanding of the cracking art of today, including its general technical and patent aspects may well be approached through consideration of the background from which commercial cracking processes were evolved.

It had been generally known prior to 1900 that the application of suitably high temperature to the heavier and higher boiling of the hydrocarbons which comprise petroleum would break them down chemically and convert a certain portion into lighter or lower boiling hydrocarbon oils, producing at the same time minor quantities of heavier hydrocarbons and gas. In view of the supposed effect on the original hydrocarbons, the name "cracking" came to be applied to such a process. None of the early investigators had, however, devised a method of producing gasoline from heavy oil on a commercial scale.

Origin of Cracking

THE first commercial process for chemical decomposition or cracking of hydrocarbon oils to make gasoline was that process developed by the Standard Oil Company of Indiana known as the Burton process. In 1910 experimental work was commenced by W. M. Burton and R. E. Humphries at Whiting, Indiana and by 1913 they had developed the process to the point where the first commercial installation was made.

Burton's method of accomplishing cracking consisted in heating up a body of an intermediate oil such as gas oil in a vessel or still by external firing, to a temperature of 800 deg. F. maximum, and distilling off and condensing gasoline formed by decomposition while maintaining a pressure of 75 to 100 lbs. on the still and condenser. United States patents were issued covering this basic process of cracking, and numerous others were issued on various improvements developed in the experimental work which has since been ceaselessly pursued.

The operation of the first commercial installation was attended with such success and was shown to be so profitable that many more commercial installations were made by the Standard Oil Company of Indiana and the use of the process was licensed to numerous other companies. The commercial success of the Burton cracking process led to a speedy general recognition of its importance to the oil industry and by 1920 there were over 400 units in operation.

At about the outset of wide commercial adoption of the Burton process, several competitive cracking processes were under development and it is timely to observe at this point the relation of the original achievement of a successful cracking process to the subsequent course of progress.

The Burton process was at first conducted on the batch principle, that is, the entire cracking operation was carried out solely on an original quantity of feed oil. Later it was possible to effect some improvement by introducing a certain amount of supplementary feed oil during the progress of the cracking. This comprised what is termed semi-continuous operation. Another characteristic feature of the process was that heat was applied to the oil in the vessel in which cracking was taking place; consequently the condition of the oil under both heating and cracking was the same. These features were disadvantageous in that they limited the nature of the starting material to a distillate oil and the extent to which cracking could be carried, as the deposition of carbon produced by the cracking reaction on the heating surfaces necessitated frequent cleanings of apparatus and correspondingly reduced the time during which the process could actually be producing gasoline. With the development of the cracking art modified methods of conducting the process were evolved to eliminate disadvantageous features and the new processes were continuous and capable of operating over long periods without interruption.

Holmes-Manley Process

THE Holmes-Manley process, first of the continuous processes to be commercially developed, embodied certain features of the Burton process and later contributed the important feature of clean circulation, utilizing the hot oil pump for returning insufficiently cracked distillate fractions to the heater for retreatment. The Dubbs process was under development at about the same time and exhibited many points of similarity to the Holmes-Manley process. The Cross process and the Tube and Tank process became commercially active shortly afterward, these two processes originally employing separate cracking and distilling zones and cracking in a single passage of oil through the heater, which distinguished them to an extent from the methods used by Holmes-Manley and Dubbs. With the nearly concurrent development of these processes it was soon evident that there was considerable overlapping of patented features, and after a complicated series of transpirations, to be described more fully later, agreements were entered into between the various parties to permit a general exchange of rights to advantageous features.

Having behind it the record of initiating commercial cracking, the Standard Oil Company of Indiana continued to pursue developments in the field and in 1921 entered into agreements with The Texas Company, and, subsequently, with other contributors to the cracking art, whereby it was possible to apply the Burton principles to a considerable variety of other processes. These later processes, due to their inherent advantages, have at the present date entirely replaced the original form of Burton cracking. The value of

the Burton principles in the pioneer development of cracking would be difficult indeed to overstate.

Cross Brothers Process

THE Cross process originated with the work of the brothers, Walter M. Cross and Roy Cross of Kansas City, Missouri, begun prior to 1913. The process developed by them was destined to become one of the most widely used and successful cracking methods and so remains, with numerous modifications, up to the present day.

The method of cracking employed by the Cross Brothers consisted generally in pumping the oil to be cracked to a heating coil of pipe enclosed in a furnace whereby the oil was raised to the cracking temperature under high pressure, and then discharged into an enlarged vessel where it was maintained at temperatures up to 900 deg. and pressures to 700 lbs. for a considerable period when cracking occurred. The material withdrawn from this reaction chamber contained the gasoline produced by cracking, the separation of which could be effected by subsequent distillation. The Cross process thus became identified with the use of high pressures and the addition of heat to the oil in the reaction zone only through the entering hot oil stream, this having the advantage that the carbon formed along with the gasoline during cracking was to a large extent excluded from the heating zone where it could deposit on surfaces and cut down the transmission of heat to the oil.

The first commercial installation of the Cross process was made in the Indian Refining Company plant at Lawrenceville, Illinois. With the incipiency of commercial importance of the process and the issuance of patents to the Cross Brothers the Gasoline Products Company was formed to promote the licensing of the Cross process generally throughout the industry. Likewise, the M. W. Kellogg Company was appointed licensing agent to undertake the actual design and erection of the cracking equipment licensed under the Cross patents. The process reached the foremost rank in the cracking field soon after the capabilities of the first commercial installations became evident, and the licensing and engineering organization which had been set up in its behalf became, in subsequent years, a highly important medium for the exchange of patent rights, the licensing of Cross and other processes and the dissemination of engineering information to licensees.

The Cross process today still embodies the fundamental principles upon which it was founded, although numerous modifications and additions have been incorporated in the design to suit the requirements of individual refiners. The separation of gasoline from the cracked liquid issuing from the reaction chamber has long been accomplished as an integral part of the process without the addition of extraneous heat and in some instances the cracking reaction of the heated oil is carried out in a pipe coil instead of the drum originally used. Provision is likewise now embodied in the process for the retreatment of unconverted fractions of the original charge oil by returning them to the heating zone. Incorporated in units of the Cross process at the present day may be provisions for the charging of crude oil and processing it to completion including initial distillation of straight run gasoline and kerosene, complete cracking and the reforming of straight run gasoline to improve its anti-knock value and suitability for high compression motors.

Tube and Tank System

THE Tube and Tank process developed by the Standard Oil Company of New Jersey was an outgrowth of experimental work conducted around 1913 to 1915. In this process, oil to be cracked is passed through a pipe coil located in a furnace, where temperatures to 900 deg. are attained, and discharges thence into an enlarged reaction chamber. During the prolonged time taken for passage of the oil through the reaction chamber, the principal amount of cracking occurs. The system was originally maintained at pressures up to 400 lbs. and the cracked products withdrawn from the reaction chamber were redistilled to separate the gasoline from unconverted fractions.

The Tube and Tank process continues in use to the present day, although like others, important modifications have been made in equipment and operating methods. It is now customary to maintain pressures up to 1000 lbs. on the heating coil and reaction chamber, which, with the temperatures employed, makes the operation substantially the same as that of the Cross process. Fractionating equipment has long been provided whereby the highly heated products from the high pressure reaction chamber are introduced into low pressure vessels where vaporization of the lighter fractions occurs and it is possible to separate the gasoline vapor from the unconverted fractions and return the latter through the heating coil for retreatment.

The mechanism of the Tube and Tank process, aside from certain individual features, has always been closely related to that of the Cross, Burton and other processes and this led to the Standard Oil Company of N. J. entering into the agreements consummated between the holders of patents on these processes as will be described later. As an individual process it has been widely used by the industry and particularly by the Standard Oil Company of New Jersey in the United States and the rest of the world as well.

The Holmes-Manley process developed by The Texas Company was the outgrowth of experimental work carried out at Port Arthur, Texas, under the supervision of Ralph C. Holmes and Frederick T. Manley, then in charge of the refining department of that company. Experimental work was commenced about the year 1915 and the first twenty-four commercial units were erected in 1920.

The Holmes-Manley process comprised originally the passing of oil through a heating coil into a reaction zone consisting of several large vessels in series which were moderately fired to prevent heat loss, substantially all cracking being carried out in the body of liquid maintained in the reaction zone and very little in the heating coil. The vaporous products from the reaction zone were passed over into a fractionator from which the gasoline formed was separated as vapor and the unconverted oil pumped back to the heating coil for retreatment. The whole system, including heating coil, reaction zone and fractionating apparatus, is maintained under pressures up to 600 lbs.

The research work which has been continuously in progress since the inception of the Holmes-Manley process has developed a large number of improvements and modifications although the process as a whole still retains its basic principles. Among the most important of the modifications is the method of operation whereby only vapor is maintained in the reaction zone, all liquid being withdrawn from this zone as fast as it enters from the heating coil. By relatively small changes in operating conditions it has been found that this method known as "Low Liquid Level" produces a cracked gasoline of much higher anti-knock value than is possible when the reaction zone is occupied by liquid. Other important modifications of the Holmes-Manley operation include its combination with other apparatus whereby crude oil can be stripped of its initial gasoline content and cracked to any degree desired in a single self-contained operation, and including, if necessary, the treatment of the naphtha produced direct from the crude to improve its anti-knock properties. The principles involved in the Holmes-Manley operation were related in some degree to those of the Tube and Tank, Burton and Cross processes, and as a consequence The Texas Company became a party to agreements reached between the owners of those processes for cross-licensing of patent rights.

An early experimental cracking plant designed and constructed by the Cross Brothers.

The installation at Port Arthur, Texas was enlarged from the original twenty units to a total of seventy-four units at one time, although the continuous initiation of improvements has so enlarged the capacity of the individual units as to make it possible to accommodate the entire plant demand with thirty-eight units. Numerous other companies as well as The Texas Company are utilizing the Holmes-Manley process.

Features of de Florez Cracking

THE de Florez process is a development of experimental work carried out jointly by The Texas Company, the Gulf Refining Company and Luis deFlorez. The first commercial installation of this process was made prior to 1929 at the Gulf Refining Company Plant at Bayonne, N. J. and its merit has led to its subsequent adoption by a number of other refiners.

The de Florez process accomplishes practically all of its cracking within the heating coil and it is distinctive in the manner of preparation of the oil to be passed through the heating coil. Fresh-feed to be cracked is passed into the system in contact with the highly heated stream issuing from the heating coil which causes distillation of the more volatile components of the fresh feed, and a suitable portion of the oil thus vaporized is condensed to form the stock to be passed to the heater. This manner of preparation of the oil fed to the heater eliminates constituents of a tarry nature which could be heated only to a limited temperature in the heater without prohibitive coke deposition therein, and thus permits the use of much higher limits of temperatures of the oil leaving the heater. This proves particularly useful where it is desired to make gasoline of high anti-knock value or to crack very tarry stocks, such as fuel oils or the like, as a great deal of trouble with coking of heating surfaces may be experienced in heating such oils themselves past certain limits. The de Florez process is readily adaptable to the cracking of oils to the extent that final products are gasoline, coke and gas, as is frequently the desired type of operation when heavy oils are to be cracked.

The patent position of the de Florez process has been very similar to the Holmes-Manley process under the arrangements which have been made with other companies for exchange of patent licenses and immunities.

Development of Dubbs Process

THE Dubbs process originated as an outgrowth of experimental work on the dehydration of oil carried out at Santa Barbara, California by Jesse A. Dubbs in the year 1909. From the original endeavors the work was directed toward cracking exclusively and the developments in the period after 1910 formed the groundwork for the important position the process was later to occupy in the industry.

As the process took definite form, the Universal Oil Products Company was formed to promote its development and licensing and the first commercial installation was licensed to the Roxana Petroleum Company at Wood River, Illinois in 1920.

The method of cracking utilized in the Dubbs process consisted in raising the oil to a cracking temperature by passage through a heating coil located in a furnace, discharging thence into an enlarged vaporizing and reaction chamber, and subjecting the evolved vapors to fractionation to separate gasoline and unconverted fractions, the latter being returned to the heating coil for retreatment. The whole system was maintained at pressures up to 400 lbs. and temperatures up to 850 deg. The operation was a continuous one, and as a result of the cracking in the heating zone being limited, the deposition of the coke formed in cracking was largely confined to the reaction chamber.

An intensive program of research was undertaken by the Universal Oil Products Company soon after its formation which led to the establishment of a very complete laboratory at Riverside, Illinois, the laboratory functioning both for fundamental research and also as a means of furnishing engineering data for the design of cracking equipment to meet the individual requirements of licensees. At the same time much attention was given to obtaining the maximum patent protection for the Dubbs process, this being stimulated by its highly competitive position with respect to other processes coming into use concurrently.

While the Dubbs process has maintained its original form, the research work has resulted in numerous advances in design and has developed many improvements. Among the most important of these advances is the operation wherein the reaction chamber is devoted to vapor entirely, the liquid being withdrawn as fast as it enters, which results in an important decrease in coke formation and an increase in anti-knock value of the naphtha produced. It has also been associated with other operations than cracking, toward the end of carrying on processing to completion within a self-contained system.

Exchange of Patent Licenses

THE patent situation accompanying the rapid progress in the cracking art since its inception soon became beset with complications and presented a generally perplexing aspect to the industry. The primary cause of this was that at the outset of general commercial use and licensing of cracking processes the individual companies engaged in the development work had striven to create and maintain independent patent positions in the newly created field. It soon became apparent, however, that the close relation of the various processes one to another and the overlapping of certain features, made some cross-licensing arrangement between the companies a virtual necessity. The first step in this direction was an exchange of patent licenses between The Texas Company and the Standard Oil Company of Indiana in 1921. This was followed by additional agreements consummated in 1923 between the Standard Oil Companies of Indiana and New Jersey, The Texas Company and the Gasoline Products

Company, whereby an exchange of patent rights was agreed upon and all parties were endowed with much more freedom for the operation and licensing of their processes. The position of the group was still further improved by the securing of licensing rights under patents of other large refiners including the Gulf Refining Company, Atlantic Refining Company, Sinclair Refining Company and the Anglo Persian Oil Company.

The Gasoline Products Company became the most active licensor for this group, although the agreements between the contributors did not prohibit licensing by them individually. The common interest of the parties in future pyrolytic cracking development led to Gasoline Products Company being established as the medium for exchange of information on process development, in which capacity it functions to correlate the research results from all sources within the group and disseminates them through the medium of designs for the modernization of old cracking equipment and installation of new equipment for licensees. In addition, the Gasoline Products Company maintains with its agent, The M. W. Kellogg Company, an elaborate research laboratory and large technical personnel for research in the pyrolytic cracking field. This laboratory and its personnel work in coordination with the research being currently conducted in the laboratories of other members of the group. The exchange and coordination of research development results, both in laboratories and plants, are effected through conferences held between the research workers, the development and operating engineers and the administrative personnel of all members of the group.

An important outgrowth of the strenuous pursuit of research work both in the laboratory and field by the various members of the group has been the type of cracking apparatus known as the Combination Unit. A unit of this class usually embodies a considerable range of distinctive features made available through the coordinated research, by which it is adapted to carry out simultaneously a number of operations from preliminary distillation of crude to the completion of the desired degree of cracking in the most advantageous manner in a self-contained system. (This type of process has proven particularly advantageous for combining the outstanding points of the original processes; its acceptance by the industry is testified to by the prominence it has occupied in recent refinery construction.)

A highly important aspect of the early patent situation was that the interests of the Universal Oil Products Company and the members of the Gasoline Products Company group had for a number of years following the establishment of the various processes continued highly divergent. Much litigation was in progress between them, both with regard to patent applications under prosecution and the operations of licensees. This litigation was very expensive and exceedingly inconvenient to both of the opposing sides and after a large amount of negotiation, it was finally terminated by a settlement reached on January 6, 1931. The conciliation was based upon common acknowledgment and evaluation of the individual contributions of the several parties to the cracking art and the outcome was a general exchange of patent immunities with regard to past operations. The settlement was participated in by the Shell Oil Company and the Standard Oil Company of California, two of the principal licensees of the Universal Oil Products Company, and subsequently the Gulf Refining Company, Atlantic Refining Company and Sinclair Refining Company became parties to it as licensees of the Gasoline Products group.

The termination of the prolonged itigation which had involved either directly or indirectly the majority of operators of cracking equipment in the United States was accepted by the industry generally as a deliverance. The settlement of the contested points of invention and the granting of immunities gave greater operating freedom to the licensees of both groups and relieved the burden of litigation but did not, however, affect the positions of the Gasoline Products Company group and the Universal Oil Products Company as competitors in the licensing of their respective processes for oil cracking.

The cracking processes and their respective proponents embraced by the Gasoline Products Company and the Universal Oil Products Company groups occupied the dominant position in the early development of the art, and have continued in this position up to the present day, to the extent that they represent by far the majority of installed cracking capacity throughout the world as is attested by the lists of users. Nevertheless, a number of other processes have appeared in recent years and have attained a considerable degree of use which warrants their consideration as important parts of the present picture.

Gyro Vapor Phase Process

THE Gyro Process first appeared in 1927, the first commercial installation being made at the Cabin Creek, West Virginia, plant of The Pure Oil Company about that time. It is fundamentally different from the other processes hereinbefore described in that it conducts cracking entirely while the oil is in the vapor phase and under exceedingly low pressures. The oil to be cracked which is preferably a rather easily vaporized stock, is preheated to about 650 deg. in a pipe coil and is discharged into a vessel at approximately 5–15 lbs. pressure where vaporization of a substantial portion takes place. This vapor is passed through additional tubes in a furnace where it is heated to the exceedingly high temperature of about 1100 deg. while still under less than 15 lbs. pressure. The cracking occurs entirely in the high temperature heating coil and on issuance from it the vapors are deluged with cold oil which reduces the temperature to below that of cracking, following which the gasoline formed is separated by fractionation from the unconverted oil. The heavy oil remaining from the cracking operation is that unvaporized fraction from the initial distillation and its amount can be regulated by the temperature used for vaporization.

The Gyro process has been claimed to be particularly notable for the high antiknock value of gasoline produced as a result of the exceedingly high temperatures used in the cracking heating coil. It has thus found considerable use for the production of the so-called premium grades of gasoline. It has the additional advantage that with the low pressures employed the structural strength of equipment is required to be only a fraction of that of units operating at high pressures.

An early installation of the Burton Cracking Process, the first to be developed.

The Gyro operation was covered in some respects by patents owned by the Gasoline Products group and at the time that active operation and licensing of the process was commenced, the Gyro Process Company, which was formed to conduct the licensing, took out a license from The Texas Company for operation in the United States under the patents in question. This license is limited, however, to the low pressure, high temperature operation substantially as has been described.

In 1931 Alco Products, Inc., a subsidiary of the American Locomotive Company, became the licensing agent for the Gyro process and since that time has been promoting the licensing and erection of Gyro process units throughout the world.

Work of Winkler-Koch Organization

THE process of the Winkler-Koch Engineering Company has come into considerable prominence in the period from 1927 onward. Cracking units designated by the name of Winkler-Koch are of the design of a firm of consulting engineers by that name located in Wichita, Kansas. U. S. A.. the guiding spirit of which is Fred C. Koch, formerly an employee of The Texas Company and Gasoline Products Company. The Winkler-Koch Engineering Company is unique in the field of cracking unit design in that it maintains no patent position whatsoever and does not license units to refineries for whom it constructs them. Users of the process, however, make contributions corresponding to royalty toward a fund established to provide defense against patent infringement litigations.

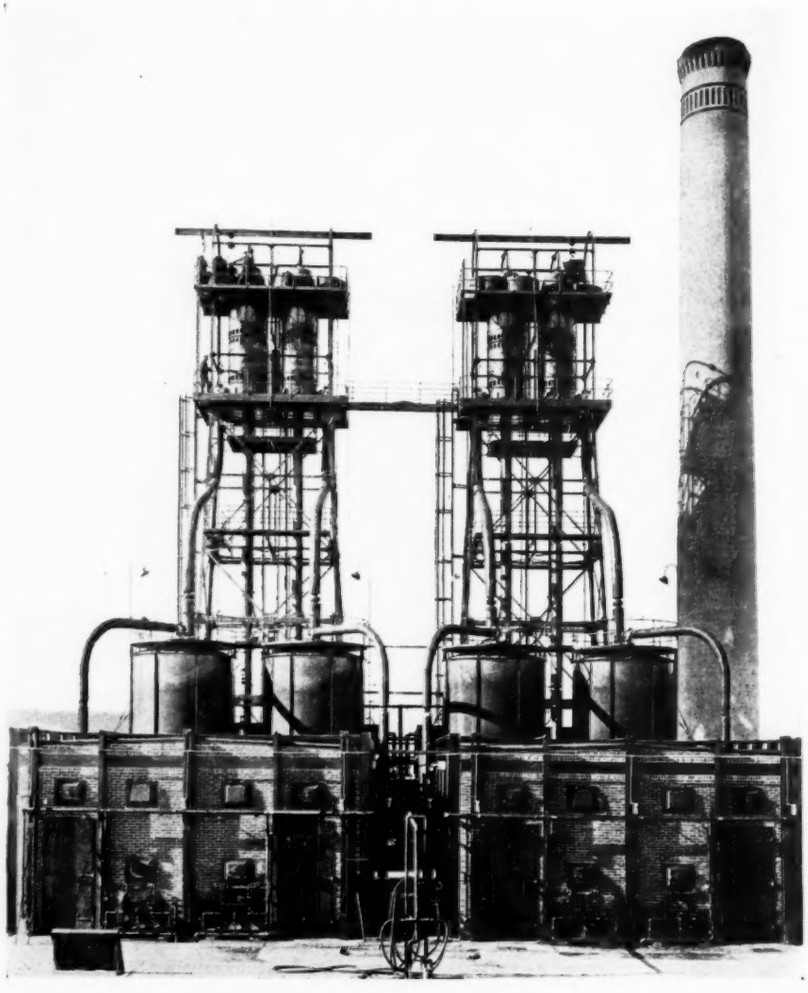
The design of Winkler-Koch Units has followed more or less uniform lines, notwithstanding the fact that they have not considered themselves bound within the scope of any patents. Customarily, the oil to be cracked is passed through a heating coil maintained under pressures up to 1000 lbs., where it is heated up to temperatures as high as 975 deg., and it discharges thence into a low pressure fractionating zone in which separation is effected between the gasoline formed, the unconverted stock to be returned to the heating coil and the fuel oil formed which is to be withdrawn from the system. A reaction chamber is usually not employed, and as a substitute a reaction section is provided as a part of the heating coil in which the oil is maintained at relatively high temperature for a suitable period. In certain modified forms of Winkler-Koch design provision is made for the primary distillation of crude in auxiliary apparatus and for the retreatment of the initial gasoline content of crude to improve its anti-knock value.

A considerable number of cracking units have been built by Winkler-Koch in the United States and elsewhere including several plants in the Soviet Union.

It has been contended by Gasoline Products and Universal Oil Products that the cracking units erected by the Winkler-Koch Engineering Company are infringements of various patents which the two companies individually own. Winkler-Koch maintain that operations of units designed by them infringe no valid patents. As a consequence, infringement suits have been filed against refiners using the process, the Winkler-Koch Engineering Company being included as a defendant. One of these has recently been tried and is awaiting decision.

A number of other cracking processes whose parentage from a patent angle is somewhat less clear are in use throughout the United States, but their number and capacity in comparison to those of the processes previously described are of little importance. The principal ones of this class are the Jenkins process, licensed by the Jenkins Petroleum Process Company of Chicago, and their agent, Graver Corporation of Chicago, the Ampco Process, designed by A. M. Peairs and his former associate, Emil Geppelt of Dallas, and the Donnelly Process licensed by the Donnelly Process Company of Chicago, Illinois. The Lincoln Clark Process has appeared in considerable publicity recently but apparently no installations have been made. Outside the United States the Carburol and Vickers organizations of German and British nationality, respectively, have built units in Russia, France and Belgian Congo. The patent background of these designs is somewhat doubtful and Gasoline Products Company has filed suit in France against Raffinerie de Petrole du Nord, a user of the Carburol Process charging infringement of French patents.

Concurrent with the development of the widely used present-day cracking processes has been the development of a number of other processes whose identity after a limited period became obscured to the extent, at least, that they now occupy no commercial licensing position. This loss of identity was usually a consequence of the rights of the process being acquired for use in one of the major processes or of lack of individuality of the process from a patent standpoint. Included in the processes which now possess no commercial licensing position are the Fleming, Greenstreet and Emerson processes, which were independently licensed, the Buerger and Alexander processes of the Gulf Refining Company, the Lewis process of the Atlantic Refining Company and the Isom Process of the Sinclair Refining Company.



Dubbs Unit, built in 1923, illustrating development in construction up to ten years ago.

Saudi Arabia Looms as Potential Producer

Concession Granted to Standard Oil of California Strengthens Company's Strategic Position in Bahrein and Adds New Factor in Near East Situation.

LONDON, SEPTEMBER

RECENT action of the Saudi Arab government in granting an extensive concession in the eastern part of its territory to Standard Oil Company of California has aroused great interest here in official and trade circles which see in this latest step the probability of adding another important factor to the already complicated situation in the Near East. Negotiations leading up to the concession, in which a former United States Assistant Secretary of State played an active part, have been under way for a long time past and it is no secret that there has been considerable competition for the right to explore and develop the petroleum resources of the strip of territory lying to the west of the Persian Gulf. Interests represented in the Iraq Petroleum Company not unnaturally felt that the acquisition of this potential field would represent a logical extension of the company's activities. Apparently, however, Abdul Azziz ibn Saud, ruler of the Saudi Arabian kingdom, who is recognized as a man of remarkable force and ability, preferred to entrust the grant to nationals of a country that he felt could have no interest in his domain beyond purely commercial exploitation.

From the viewpoint of Standard Oil Company of California the step now taken is a natural expansion of the activities it has been carrying on during the past few years on the island of Bahrein. A glance at the map will show that this island, or rather group of islands, is located in the western part of the Persian Gulf, close to the eastern border of Saudi Arabia. A concession to explore for petroleum in Bahrein formerly was held by the Gulf Petroleum Company. Owing to its participation in the Iraq Petroleum Company, however, the Gulf was not in a position to develop this concession as an independent venture and several years ago transferred its rights to Standard Oil Company of California. That company, through its wholly owned subsidiary, the Bahrein Petroleum Company Ltd., has been engaged in surveying and proving its Bahrein holdings since 1930.

During the first year the work was confined to a geological survey of the main island—Bahrein. The report of the geologists was so favorable that in the early months of 1931 a drilling party, with a proper supply of equipment, was sent out, arriving at Bahrein in May of that year.

The topographical and structural formation of Bahrein presents few difficulties to the experienced driller. The island is some 30 miles long by 10 miles wide and its southern part, to which drilling operations thus far have been confined. is practically a barren desert with scarcely any vegetation. In the northern section, owing to the presence of fresh water springs, there are attractive gardens of date palms and other tropical plants. From the beaches the ground rises gently to an elevation of 150 to 200 ft. and the interior of this island is rough and broken with a central depression from which rises Bahrein's one important height—Jebel Dukhan—with an elevation of 440 ft. It was near the southern base of this miniature mountain that Jebel Dukhan No. 1, the discovery well of the Bahrein Petroleum Company, was put down. In June 1932, at a depth of 2,008 ft., a flow of gas and oil was encountered in this well. The flow was substantial and, owing to the fact that cable tools had been used in sinking the well, it was decided not to attempt to penetrate further but to try another location. No. 2 was thereupon started about two and a half miles north of No. 1. In January 1933, at approximately the same depth as that of the first well, No. 2 developed a flow of some 1,500 bbl. Drilling was then suspended and No. 3 was started. In this case the cable tools were replaced by a rotary drilling rig at a depth of 1,635 ft. in an attempt to determine the productiveness of lower lying strata. The company has not officially announced the results obtained from this well, but from the fact that No. 4 is well on its way and that locations for several other wells have been selected it may be assumed that the showing thus far made is considered entirely satisfactory.

Geologists who are familiar with Bahrein consider that for the size of the territory involved the islands contain possibilities of becoming as productive a field as any heretofore developed in the Near East. The same applies to the eastern part of the mainland which although never fully prospected has been visited at different times by a number of geological parties. The oil found in Bahrein is similar to that produced in the Anglo-Persian and Kirkuk fields lying to the northward. The output of Jebel Dukhan No. 2 is officially reported to be a 33 deg. plus A. P. I. test oil.

Of the difficulties attendant on the development of oil production and shipment in Bahrein the most serious are those of climate and transport. Summer temperatures run up to 120 deg. F and higher which, with the attendant humidity, creates very trying conditions for Europeans or Americans. Bahrein is surrounded by coral reefs which prevent the close approach of any but light draft sailing vessels. Ordinary ocean steamers are compelled to anchor several miles off shore. Passengers and freight must be transferred to lighters in order to get ashore and the task of handling heavy equipment under these conditions is no light one. When the Bahrein oil field gets into full production one of its features no doubt will be a submarine pipeline 10 to 15 miles long which will enable seagoing tankers to load at a safe anchorage.

Under the circumstances surrounding its work, the distance from base supplies, the difficulties of transport and the necessity of training local workers, the achievement of the staff of the Bahrein Petroleum Company during the past two years in bringing in a number of producing wells may be considered a remarkable one. It is due to the energy and resourcefulness of the company's manager, E. A. Skinner, its chief local representative, Major Frank Holmes, and the other members of the staff, including E. H. Smith, W. R. Haenggi, J. Schloesslin, W. Elste and Roy Lowenfels.

Politically Bahrein is an interesting country, a hereditary sheikdom presided over by the Sheik Hamad with whom the American oil men have remained on the most cordial terms. For half a century or more Great Britain has exercised a friendly protective interest in Bahrein although the island is not a British protectorate but is, to all practical interests

Drilling crew of Lok Batan (Russia) No. 45: head driller is 83 years old, having spent 54 years in the oil business.

and purposes, an autonomous kingdom. In the future its name is likely to become much better known to the world at large and to the oil industry in particular than it is today.

By extending its sphere of operations to the mainland and obtaining a concession for working the petroleum rights of eastern Saudi Arabia the Standard Oil Company of California has greatly strengthened its position in the Near East, or at least it will have done so if the expected happens and this territory proves to be a large producer of high grade oil. Although the terms of the agreement were officially published in Arabic only on July 21 last the work of geological exploration is to begin at once and the record which the company has made in Bahrein indicates that it will push forward the task of proving the field with all reasonable speed. Under the terms of its agreement the company is allowed three years from the end of September 1933 in which to begin actual drilling.

The contract itself which was signed by the Minister of Finance of the Saudi Arabian kingdom, acting for King Abdul Azziz ibn Abdul Rahman al Faisal al Saud, to give him his full and sonorous title, and by Lloyd Nelson Hamilton for the Standard Oil Company of California, recites that the company shall have the right "to explore and search for and drill and extract and treat and manufacture and transport and export" all manner of petroleum, asphalt, oil, natural fats and other carbonaceous matter in an area lying in the eastern portion of the Saudi Arabian kingdom the exact limits of which are defined in a supplementary agreement not made public. The period of the concession is 60 years but the company has the right to cancel it at any time on 30 days notice while the government can void the agreement only in case of definite breach of contract through failure to make stipulated payments.

In consideration of the privileges granted the company agrees to make to the government an initial loan, the amount of which is covered by a supplementary document and is not revealed. On the discovery of oil in commercial quantities the company is to make a further loan and, a year later, another one. These apparently are in the nature of advance royalties. During the period of preliminary development the company is also to pay an "annual rent" but this payment is to cease with the commencement of commercial production and is to be replaced by a royalty of four shillings gold per ton or its equivalent in United States currency.

Following the development of oil in commercial quantities the company is required to set up a refinery capable of producing the quantities of petrol and kerosene needed by the government for its own use and shall deliver annually to the government without charge 200,000 American gallons of petrol and 100,000 gallons of kerosene. On this, of course, no royalty is paid and the company is specifically exempted from all taxes, import or export duties, except that the government may levy a tax on products sold within the country for domestic use.

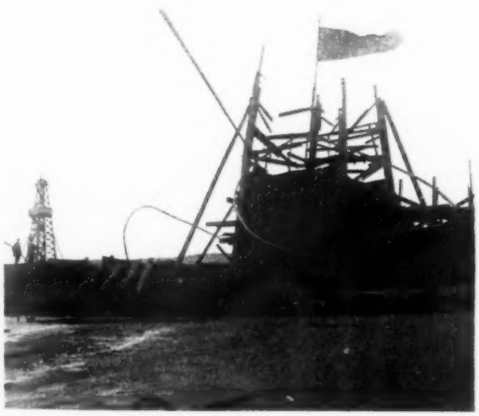
In its provision of royalty payments the contract is practically the same as that of the Iraq Petroleum Company with the Iraqui government. The agreement is particularly liberal in its authorization to

Lok Batan No. 45 blowing in during May for 150,000 bbl. daily initial production.

A flood of oil in one of Russia's new prolific fields.

the company to withdraw at any time and in granting the use of public facilities and resources. In general it testifies the desire of King Abdul Azziz to cooperate in every reasonable way in the development of the potential oil reserves of his kingdom.

Of more interest to the oil company officials and investors in oil securities here than the precise terms upon which the Standard Oil Company of California is entering upon the development of the Bahrein and Saudi Arabian fields is the possibility that within a comparatively short time another considerable addition will be made to the annual world production of petroleum of which there admittedly is too much already. It is beginning to be appreciated more clearly than heretofore that the most important theatre of development for petroleum in the immediate future is to be the Near East. Since local consumption in these countries is a negligible quantity it follows that the oil originating in the area between the Mediterranean and the Indian Ocean must displace supplies from other less economical or less favorably situated areas. That is to say, it must do this unless consumption grows at a rate which nobody conversant with present day conditions anticipates as probable, or indeed even possible.



Lok Batan No. 45 under the Red flag to indicate that it had been brought under control.

Within another year the Iraq pipelines now being pushed to completion across the desert wastes of Western Asia will begin spouting a minimum of 4,000,000 tons yearly on the eastern shores of the Mediterranean. For all practical purposes completion of the pipelines will mean moving Kirkuk oil to Haifa and Tripoli whence a short and inexpensive water route will place it in any of the Mediterranean ports or in the markets of northern Europe.

The constitution of the Iraq Petroleum Company, moreover, is such that the interests represented in it necessarily must find outlets for their respective shares of the output. France is hopefully looking to Iraq oil to supply a considerable part of the national needs. The American companies participating in the Iraq development naturally will utilize their share to supply foreign customers, reducing to that extent their shipments from the United States and South America. British and Dutch interests must find place for their share in markets for which they possess supplies already more than ample.

Soldiers of Red Army hastily constructing reservoirs for mighty flood of oil from Lok Batan No. 45.

The Kirkuk field, however, is not the only new source of supply with which the petroleum industry is likely to be forced to reckon in the near future. Active preparations are under way by Mosul Oilfields, Ltd. for the development of its concession in Western Iraq and its plans include the construction of a third pipeline to the Mediterranean. Affiliations of the company with interests in Italy, France and Germany may prove important factors in gaining access to these important markets. Addition to these supplies of whatever quantity may be developed by the Standard Oil Company of California in Bahrein and Saudi Arabia may mean that within the space of some five or six years the world's markets may be called upon to absorb some 7,000,000 to 8,000,000 tons of added annual production from Near Eastern territory.

Ten or a dozen years ago such a prospect would have been welcomed both within and without the oil industry. Today, when the industry is struggling, thus far with no great success, to reduce its excess supplies to a point where they will not overbalance current requirements, it is a distinct cause of apprehension.

Lok Batan No. 45, responsible for the flood, is not visible.

A question of highly pertinent interest is: What country or what group of producers will give ground to make room for the increasing flood of oil likely to pour soon from the pools of the Near East? Curtailment of production even with the incentive of a possible increase in price is demonstrably difficult of attainment but nobody will contemplate calmly the cutting down of his share in established trade merely to provide business for a newcomer who can present no claim on an "as is" basis. Yet it appears inevitable, barring the development of an unanticipated new demand for petroleum, that some one or more of the existing sources of petroleum supply will have to submit to a shrinkage in its volume of business as Western Asia increases its output.

At first glance it would seem that the expansion of Near East production might place the Anglo-Persian Oil Company in a difficult position since its products, in order to reach Europe, must stand the long voyage from the Persian Gulf and pay tolls for passing through the Suez Canal. It must be remembered, however, that Anglo-Persian occupies a field that has been scientifically developed and is reputed to be one of the cheapest producers in the world. With its relations with the Persian government on a better basis than heretofore and with the powerful interest of the British government in its continued prosperity the company has strong backing which may prove of great future assistance. For its properties in the Transferred Territories Anglo-Persian will very probably be able to provide a connection with the Iraq Pipeline and so gain the advantage, for these wells, of a direct outlet to the Mediterranean.

Russia and Roumania undoubtedly will feel the impact of the Near Eastern Oil. Since, however, Russia's policy has been to export regardless of price and since the peculiar political organization of the Soviet Union makes a continuation of this policy possible it appears that any diminution of export activities in the more distant future on the part of the Russians must be a voluntary one.

Some adverse effect upon production and export from the Dutch East Indies may be felt as a consequence of expansion in the Near East but in the last analysis it appears probable that the heaviest loss in trade, if any loss becomes necessary, must fall upon the Americas—North and South. Exports from the United States, already dwindling, may and probably will be further curtailed somewhat in proportion to the increase in output from the Near East.

Changes such as these are not likely to take place without a struggle. To those who give serious thought to the present and future state of the international oil trade it appears increasingly important that an international agreement be reached among the principal producing and exporting countries and that such an understanding be arrived at before Iraq oil comes upon the world market creating a situation more difficult of solution.

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Criticism of Knock Rating by Motor Method

New Motor Method of Determining Gasoline Anti-Knock Rating, Developed as a Result of Uniontown Hill Tests, is Regarded with Divided Opinions by the Refining Industry.

ALTHOUGH the C. F. R. Motor Method for the determination of anti-knock value of gasoline has been adopted by the A. S. T. M. as a Tentative Standard and is used by almost the entire industry, the opinions of several important refiners as to its accuracy and practical usefulness are of interest as the result of an adequate period of test for this method. Three distinct points of view are apparent in discussions of the C. F. R. Motor Method: those who favor it for various reasons; those who are not fully in agreement; and finally the practical view which suggests that whatever personal preferences may be, the Motor Method is actually in use by a large majority and the limitations of competition make its use necessary.

This last point of view, expressed by an important refiner, is that of the practical business man. The feeling exists that, naturally the refiner does not wish to incur any unnecessary expense in producing higher octane gasoline than is necessary but that he does feel that the Motor Method is more accurate than the C. F. R. Research Method. While it appears unnecessary to manufacture a gasoline with a higher octane rating than 65 (new method) the fact that the majority of the trade have standardized on the new method, is sufficient reason for conforming to the new test, purely as a matter of competition whatever preference the individual refiner may have.

Those, in a considerable majority, who believe that the new method (jacket temperature of 212 deg. F. with the fuel-air mixture preheated to 300 deg. F.) is more satisfactory, refer to the value of having a standard method as compared with the confusion that existed formerly when several methods were in use. This section of the refining industry feels that the Motor Method comes closer to duplicating actual road conditions for present day automobiles than any other available test. While these refiners are aware that conditions may so change within the next few years that the Motor Method will have to be modified in certain directions, there is no reason to believe that the test should be less rather than more severe.

An important refining company expresses their feeling on the new Motor Method as follows:

"It is our opinion that the Cooperative Fuel Research Steering Committee intelligently handled this matter, according to the information in the various technical

journals, in developing a test which gave the best correlation with the average of existing cars. Our company, therefore, is definitely in favor of the new Motor Method operating under present conditions. The situation may change slightly as cars change, but we have no information that would tend to modify our conviction that the new Motor Method is as good a method as is available even though it does not check with all individual cars."

This statement is representative of the attitude of a large part of the refining industry. While it is possible that better methods of anti-knock rating may be developed in future, this is the best available at the present time and in relation to present cars; that it is superior to other older methods, despite obvious minor imperfections; and that in any case a standard is preferable to the confusion that existed before the adoption by the A. S. T. M. of the new Motor Method as a Tentative Standard.

Objections to the new Motor Method are not lacking, however, and from large and important refining companies, although, perhaps, fewer in number than those who favor the new method. Objections are raised on the ground that the new Motor Method penalizes certain gasolines unduly. Those in opposition to the Tentative Standard, favor, either the C. F. R. Research Method of determining anti-knock or the use of air intake temperature somewhat below 300 deg. F.

It is pointed out by this section of the refining industry that conditions at Uniontown where the tests of correlation between road tests and laboratory methods were made, were not representative. The tests, being carried out in August hardly gave a representative atmospheric temperature for the whole country all year round. A better average atmospheric temperature, they suggest, might have been selected. Moreover the Uniontown hill is so severe as to create higher operating temperatures than would be normal.

A second important reason for considering the test less than accurate was the small number of cars used. While there are a great number of older cars in use on the roads, the Uniontown tests did not include sufficient older cars to be truly representative. Due to the small number of cars used, one or two automobiles, which are very little used, had a disproportionally large effect on the final results.

Another very important refining company objected to the adoption of the Motor Method as a Tentative Standard by the A. S. T. M. and based their objection on the grounds that it was against the traditional policy of the A. S. T. M. which in similar cases has been to assist the industry to standardize its procedure, rather than to attempt radical changes in the method without cause. Careful investigation indicated that the Uniontown test used cars that actually represented less than 10 percent of the cars in use on American roads. This was primarily due to the fact that older models were not represented at Uniontown. The C. F. R. Research Method, however, agreed with the Ethyl series 30 knock testing engine which represented actual conditions in about 80 percent of the cars in use at the time of the Uniontown tests. Three of the 11 motor fuels used were premium grades, while it is obvious that no such percentage of premium motor fuels are actually in use. Interpretation of the results of the Uniontown tests is said to have been faulty and it is clear that changes must constantly be made in the Motor Method if it is to agree with actual road conditions. If the standard method is subject to repeated changes, this refiner holds that it should not be adopted as a standard by the A. S. T. M.—that other tests, eliminating the objectionable features of the Uniontown tests should be held to assure the industry that the method of determining octane rating will agree more closely with actual road conditions, in the cars that are being used on the roads of the United States and that will lead to a method that will be a true standard.

While those who favor the new method and those who are not in full agreement with it, both have sound reasons for their stand, although reasons of a totally different nature, it seems obvious at this time that the industry will continue to use the new Motor Method as the standard tests for anti-knock rating, at least for the immediate future although it may subsequently be modified as motors change.

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New Lobitos Refinery

WORK is to begin shortly on the construction of a new refinery which is to be erected by Lobitos Oilfields Ltd. at Ellesmere Port on the Manchester Ship Canal, England. The plant will include distillation and vacuum units capable of handling 2,200 bbl. of crude daily. Contracts for supplying this equipment have been placed with Alco Products International.

The new refinery will afford an outlet for Peruvian crude produced by Lobitos and thereby will improve its marketing position.

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Growth of French Refining

INDICATIVE of the great expansion in French refining facilities during the year are the statistics of runs to stills which show that during the first half of 1933 these amounted to 7,242,613 bbl. as compared with 2,335,583 bbl. during the corresponding period of 1932. Production of refined products in the first half of 1933 was 884,932 metric tons in comparison with 320,009 tons in the similar period in 1932.

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A Correction

IN AN article dealing with British petrol and motor vehicle taxation published in September WORLD PETROLEUM (p. 279) the amount of revenue derived from motor vehicles in Great Britain in 1932 was stated as $28,396,000. As the context clearly revealed the figure should have been £28,396,000.

▼

Production Allowables Effective October 1

NEW allocations of production by states for the United States were announced by Federal Oil Administrator Harold L. Ickes on September 28 to become effective October 1. The new quotas result in a net decrease in crude oil production of approximately 167,200 bbl. daily for the entire United States.

Production Allowable by Districts

Effective October 1

	Barrels per Day
Arkansas	33,000
California	440,000
Kansas	106,000
Louisiana	70,000
New Mexico	41,400
Oklahoma	470,000
Texas	925,000
Rocky Mountain district	38,900
Appalachian district	94,200
Michigan	30,000

This order changes the former total daily allowable crude production for the United States from 2,409,700 bbl. to 2,242,500 bbl. and the figures in the accompanying table compare with those given in the table on page 344 of this issue.

The Administrator also ruled that those states which overproduced under the allowables for September must make up such overproduction by deducting it from October allocations given in the accompanying table.

Europe's Largest Oil Port

Growing Importance of the German Market Makes Provisions for Safety and Increased Efficiency in the Oil Port of Hamburg of Particular Importance to Importers.

THE DEVELOPMENT of the oil port of Hamburg dates back to the year 1880, when the increasing imports of mineral products created an imperative demand for the building of a special petroleum port, the old primitive landing places in no way meeting the requirements of the increasing traffic. Until 1880, a small island, the "Baakenwerder" served as storage place for resin, turpentin and naphta-kerosene, the principal mineral products imported in that period. The fire hazard necessitated the transferring of depots to a more isolated storage place. The City authorities decided then to erect a special oil port on the Graasbrook. This first port was 1,000 ft. long and 330 ft. wide. It provided for the anchorage of 11 sea-going vessels, which could be unloaded direct, without the use of barges. Tankage covered in the early days of the port 947,000 sq. ft. In 1880, 470,000 bbl. and in 1881, 680,000 bbl. were handled.

A great step forward was the construction of the first tanker, built by one of the founders of the Dapolin (Standard). That sailing ship ANDROMEDA is the first known sample of a ship built specially to carry oil in bulk. The keen pioneers of the Dapolin were at first badly handicapped by the obstinate refusal of the crews to go on board since they considered it tempting fate to run such a dangerous ship. Despite all obstacles, the tanker made its triumphal way and revolutionized the petroleum market. The transport of kerosene, the chief product imported formerly, had been rather expensive as it was shipped in barrels, and the introduction of the tankers lowered the price for this product by 50 percent. The imports increased steadily so that the harbor had to be enlarged several times.

In the year 1910, the authorities of the City of Hamburg decided to transfer the oil port to a place that reduced the fire hazard to a minimum and that provided for future expansion.

This new port is situated on the western banks of the Elbe, approximately three miles away from the present harbor center, and on the eastern side of the new large ports of Waltershof. It was opened for traffic in 1914. The basin covers 1,614,000 sq. ft. and provides for landing places with a frontage of 5,000 ft. The depth is 33 ft; the shores are 6,500 ft. long. The entire space for transit and storage of oil and its products covers 6,628,000 sq. ft. All these areas are rented to the various oil firms.

Tank Storage at Hamburg

250 storage tanks capacity in bbl.	3,700,000
Benzol, gasoline, light oils	1,750,000
Heavy motor fuel, gas oil, etc.	560,000
Heavy oils, lubricants	1,120,000
Other storage places for heavy oils	980,000
On the Prussian shore of the Elbe river	2,667,000
Storage capacity of the entire district of Hamburg and environs	7,077,000

The land around the oil port is rented to the leading oil concerns and importers, who have erected on it all the necessary installations for the handling of mineral products. Tankers of 15,000 tons can be unloaded in a minimum of time.

After the invention of the internal combustion engine, the imports of oil products grew rapidly. While kerosene was formerly the most important product, gasoline and crude have replaced it more and more.

Imports and Exports 1929–1932

OIL IS ONE of the most important items in the statistics of the harbor of Hamburg. From 1929–1932, its share was $\frac{1}{8}$ of the total imports and $\frac{1}{25}$ of the exports.

Oil Movement Through Hamburg

	Imports		Exports	
	Quantity bbl.	Value RM	Quantity bbl.	Value RM
1929	14,518,000	291,000,000	2,373,000	78,000,000
1930	14,000,000	255,100,000	2,884,000	83,300,000
1931	11,683,000	131,400,000	3,261,000	62,500,000
1932	9,000,000	80,000,000	1,800,000	34,000,000

Origin of Petroleum Imported Through Hamburg

	U. S. A.	Other America	Russia	Rou-mania	Persia and India
1929	6,188,000	3,514,000	1,855,000	794,000	749,000
1930	5,313,000	4,284,000	2,163,000	658,000	938,000
1931	3,094,000	3,949,000	2,408,000	861,000	1,050,000

Figures for 1932 not yet available.

An exceedingly efficient fire hazard protection has been developed. The space in the neighborhood of the port is entirely reserved for transit, storage, filling and mixing. No industrial treatment of the products is permitted. Tanks or stacks of barrels must be erected in cavities and surrounded by walls of at least 40 inches width. Within one wall, a maximum of 84,000 bbl. of light products and 168,000 bbl. of dangerous gas oil, kerosene, etc. may be stored. The erection of any buildings inside these walls is prohibited. Between these walls, spaces of 15 ft. width are to be left open for traffic and pipelines. Each tank space is to be provided with outlets and gate valves.

The lower end of these outlets is to be below the low-water mark. All storage buildings must be constructed of non-inflammable material; other buildings are to be kept from the tanks or stacks for a distance of at least 30 ft. Internal combustion engines are to be stationed at least 75 ft. from the tanks.

Tanks must be tested by water before they are put in use and are to be provided with lightning conductors. Tanks for storage of light products are to be equipped with a proper sprinkler system, such as is becoming more and more popular in this country in big buildings such as retail stores and offices.

At the oil port, a permanent fire guard is stationed, which is equipped with the most modern land and water fire fighting appliances. The basin can be shut off and separated from the other basins by iron pontons in case of fire or leakage from tanks or ships. Ample hydrants and telephones enable the crews to deal promptly with any outbreak of fire. Finally, modern foam installations bring the fire guard equipment to a maximum of efficiency.

Tankers must be unloaded and loaded in the oil port; the customs formalities are executed here too. The crews have to abandon the ship as soon as it is at anchor. On tankers carrying light products, no boilers or fires are permitted. Tankers carrying heavy oils may be equipped with boilers which must be fired with fuel oil.

Summarizing all these provisions, it must be said, that this port guarantees a maximum of safety that is almost unique in this branch. It may be of interest that no fire has been recorded during the last 25 years, a fact of which the administration of Hamburg is very proud.

World Oil Production—Official Figures for 1933

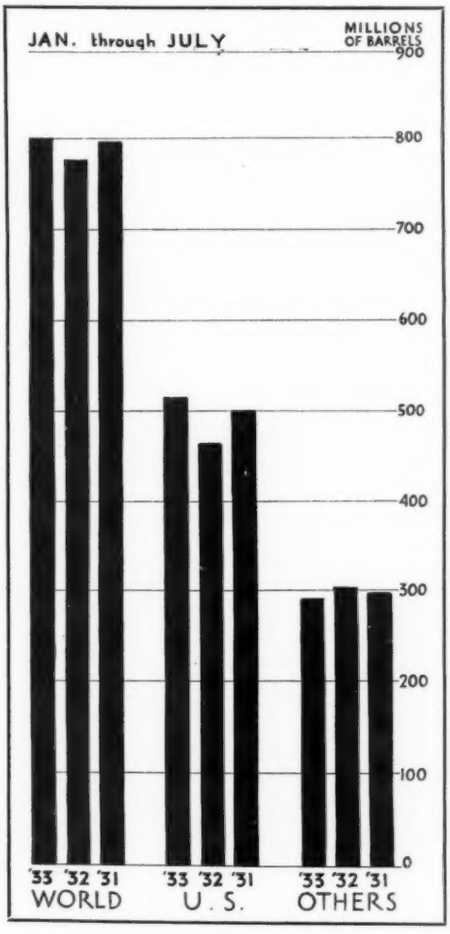
All figures furnished direct to WORLD PETROLEUM by Governments, except where otherwise specified

(Figures in U. S. Barrels—Conversion ratio 7 bbl. =1 ton)

Country	January 1933	February 1933	March 1933	April 1933	May 1933	June 1933	July 1933	August 1933
United States	63,998,000	61,029,000	75,302,000	65,313,000	84,747,000	82,841,000	84,387,000	85,190,000[4]
Russia	10,382,400	10,162,600	11,003,300	11,824,400	12,794,600	12,489,400	11,837,000	12,000,000[3]
Venezuela	8,750,000	9,985,711	10,324,328	9,340,870	9,380,893	9,354,387	10,197,425	10,367,511
Roumania	3,999,898	3,661,749	4,009,649	3,949,001	4,104,919	4,490,220	4,755,600	3,500,000[1]
Persia[2]	3,563,112	2,929,668	3,683,386	3,984,519	4,370,835	4,300,000[1]	4,300,000[1]	4,300,000[1]
Mexico	2,889,658	2,543,443	2,825,021	3,011,973	2,857,620	2,805,353	2,950,803	2,893,211
Netherland India	3,096,051	3,031,021	3,390,051	3,028,639	3,357,214	3,280,382	3,249,428	3,300,000[1]
Colombia	1,005,353	1,035,273	1,218,626	1,093,410	1,169,238	1,113,328	1,189,655[3]	1,164,104[3]
Argentina (+00)	1,138,500	1,153,500	1,140,000	1,051,000	1,210,300	1,181,500	1,180,000[1]	1,180,000[1]
Peru	976,931	806,785	942,940	988,766	1,807,565	1,750,206	1,183,527	1,284,726
Trinidad	815,439	778,842	839,857	834,876	816,080	772,626	759,076	780,893
British India	732,894	669,617	761,302	708,703	729,669	741,244	700,000[1]	700,000[1]
Poland	338,100	299,845	329,224	318,619	326,900	326,830	336,553	332,934
Sarawak	180,320	194,166	214,984	196,595	203,385	184,250	196,756[1]	175,000[1]
Japan and Taiwan[1]	195,000	195,000	195,000	195,000	195,000	195,000	195,000	195,000
Egypt	136,451	126,861	131,964	124,103	138,348	137,620	136,752	143,836
Ecuador	133,912	119,345	128,504	121,647	128,226	141,640	147,889	148,467
Canada	82,778	73,087	87,218	84,974	89,754	113,447	99,510	100,602
Germany	130,732[5]	121,835[5]	141,183[5]	129,591[5]	134,666[5]	130,200[5]	141,414[5]	131,300[1]
Iraq[1]	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
France[1]	46,000	46,000	46,000	46,000	46,000	46,000	46,000	46,000
Others[1]	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000
Total	102,727,529	99,099,348	116,850,537	106,481,686	128,744,212	126,530,633	128,125,388	128,069,584

[1] Estimate. [2] Anglo-Persian Oil Co. figures revised; fuel oil returned to the ground has been deducted. [3] Thuringea estimated 7,000 bbl.; official figure for Prussia. Sakhalin Russian included with Russia. Sakhalin Japanese included with Japan. [4] A.P.I. estimate. [5] International Petroleum Company's figures.

Comparison of crude oil production in the United States, all other countries and total for the world during the first seven months of 1933 and corresponding periods of 1932 and 1931.



Official Figures for 1931, 1932 and First Eight Months of 1933

Country	Total 1931	Daily Average 1931	Total 1932	Daily Average 1932	Total 8 months 1933	Daily Average 8 months 1933
United States	851,081,000	2,331,729	781,845,000	2,136,188	602,807,000	2,480,687
Russia	156,342,900	428,336	149,719,000	409,070	92,490,700	380,632
Venezuela	120,343,104	329,707	119,596,512	326,766	77,701,125	319,758
Roumania	46,333,945	126,942	50,491,205	137,954	32,471,036	133,626
Persia	40,253,486	110,283	45,122,455	123,285	31,431,520	129,348
Mexico	33,038,853	90,517	32,802,285	89,624	22,777,082	93,733
Netherland India	32,818,346	89,913	39,584,027	108,153	25,732,786	105,896
Colombia	18,237,190	49,965	16,384,956	44,768	8,988,987	36,991
Argentina	11,709,759	32,081	13,166,900	35,975	9,234,800	38,040
Peru	10,102,116	27,677	9,899,266	26,026	9,741,446	40,088
Trinidad	9,743,763	26,695	10,023,780	27,387	6,397,689	26,328
British India	7,830,101	21,452	8,600,312	23,500	5,743,429	23,635
Poland	4,397,760	12,048	3,905,230	10,670	2,609,005	10,736
Sarawak	3,338,472	9,146	2,274,043	6,213	1,545,456	6,360
Japan and Taiwan	1,884,285	5,135	2,340,000	6,393	1,560,000	6,419
Egypt	1,845,938	5,057	1,742,370	4,760	1,075,935	4,428
Ecuador	1,750,633	4,796	1,573,857	4,300	1,069,630	4,402
Canada	1,583,339	4,337	1,054,373	2,880	731,370	3,009
Germany	1,778,602	4,873	1,824,019	4,983	1,060,921	4,366
Iraq	1,200,000	3,300	1,200,000	3,300	800,000	3,292
France	512,862	1,405	552,000	1,508	368,000	1,514
Others	338,700	930	432,000	1,180	288,000	1,185
Total	1,256,465,154	3,442,370	1,294,134,090	3,535,885	936,628,917	3,854,439

UNITED STATES

	Daily Production bbl.	Daily Runs to Stills bbl.	Gasoline Stocks bbl.	Imports for week bbl.	California Shipm. East for week bbl.
Week Ending Aug. 26	2,775,620	2,640,000	54,610,000	1,081,000	170,000
	625,170*				
Week Ending Sept. 2	2,795,070	2,550,000	53,450,000	1,230,000	641,000
	683,120*				
Week Ending Sept. 9	2,715,410	2,530,000	52,910,000	617,000	113,000
	636,560*				
Week Ending Sept. 16	2,482,390	2,550,000	51,570,000	903,000	485,000
	470,000*				
Week Ending Sept. 23	2,487,000	2,339,000	49,944,000	515,000	none
	450,600				

Underlined figures indicate improvement in statistical position—decrease in production, runs to stills, gasoline stocks and imports.

***Total estimated production, official and unreported, of the Rusk-Gregg field, East Texas.**

Imports Limited by NRA

DURING July, 1933, total imports of all petroleum products increased to 4,693,000 bbl. as compared with 2,855,000 bbl. imported in the preceding month. The increase in imports to the volume imported prior to May, 1933, was due to the advanced prices for petroleum products in the United States, which were so low in May and June that during that period purchases were made from domestic fields and refineries, and thus caused a temporary decline in imports. The total imports, however, still continued considerably under the pre-tariff period, 9,090,000 bbl. per month having been brought into the United States during the first six duty-free months of 1932. A nominal volume of 1,000 bbl. of motor fuel was imported during July, 1933, as compared with a month'y average of 1,272,000 bbl. imported during the first six duty-free months of 1932.

Under the order of the Federal Oil Administrator effective September 8, 1933, the imports of all petroleum products into the United States have been limited to the average imports during the second half of 1932, when such imports averaged 108,400 bbl. per day.

Exports of all petroleum products, including motor fuel, increased considerably in July, 1933, following a sharp increase in the preceding month, and reached the highest volume since October of 1930. The radical increase in exports was influenced by the low prices prevailing in United States during May and June, the July exports being due in part to contract requirements entered into during the preceding month. Total exports in July, 1933, amounted to 11,966,000 bbl. as compared with 9,471,000 bbl. exported in June, 1933, an increase of 26.3 percent; and 66.6 percent above the total exports in July of 1932. Motor fuel exports increased to 3,303,000 bbl. in July, 1933, as compared with 2,610,000 bbl. exported in June, an increase of 26.1 percent; and 39.8 percent above motor fuel exports in the corresponding month of 1932. Exports of crude oil from the United States continued at an unusually high rate during July, 1933, reaching 4,523,000 bbl., a new record figure, influenced by domestic overproduction and resulting low prices. In fact, actual prices to European purchasers must be considered as still lower because of the cheapness of the dollar in terms of gold currencies. Thus with 30 percent discount in June the East Texas crude oil price of 50 cents per barrel was actually 35 cents, and July price of 75 cents was actually 52.5 cents, while current 40 percent dollar discount makes the present 90-cent per barrel price of East Texas crude but 54 cents in terms of gold currencies.

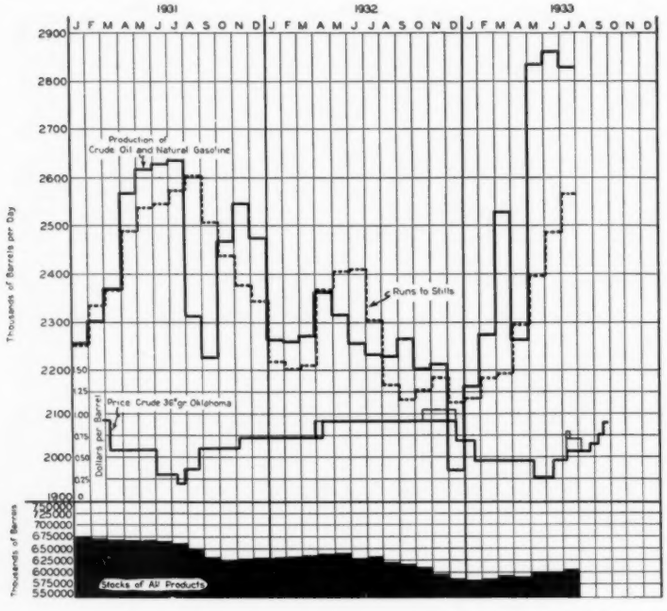
Production and Runs Excessive

CRUDE oil and natural gasoline production during July, 1933, averaged 2,817,000 bbl. per day, 38,000 bbl. per day under the production in the preceding month, and for the third month in succession at the highest daily output recorded since October of 1929. The uneconomically high rate of crude oil production was extended into August, and was cut only by Federal intervention when Secretary of the Interior and Oil Administrator, Harold L. Ickes, ordered a reduction of crude oil production to 2,409,700 bbl. per day effective September 8.

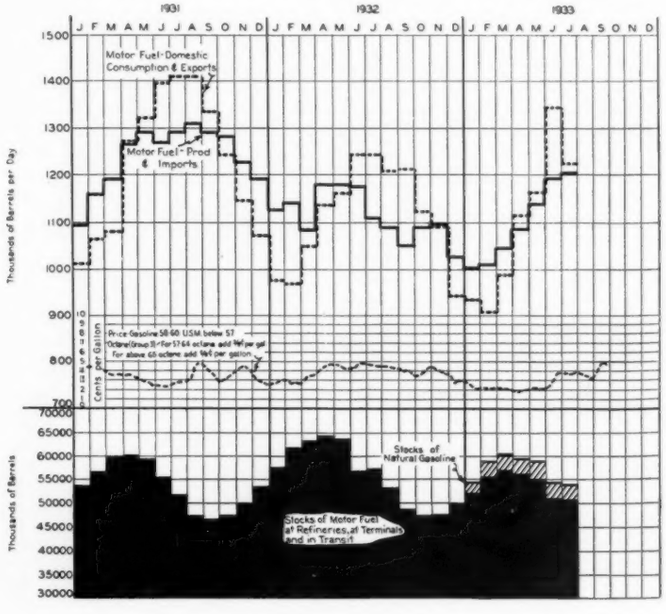
Total stocks of all oils increased 5,963,000 bbl. during July, 1933, to a total of 605,549,000 bbl., indicating a daily gross addition to stocks of 192,600 bbl.

Crude oil runs to stills continued till the middle of September at an unduly high rate, being in excess of 2,500,000 bbl. per day since the middle of June, 1933.

U. S. production, runs to stills and price of crude oil in relation to stocks of all petroleum products.


1931
1932
1933
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Thousands of Barrels per Day
Production of Crude Oil and Natural Gasoline
Runs to Stills
Price Crude 36° gr Oklahoma
Dollars per Barrel
Thousands of Barrels
Stocks of All Products

U. S. consumption and exports, production, imports and prices of motor fuel in relation to motor fuel stocks.


1931
1932
1933
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Thousands of Barrels per Day
Motor Fuel-Domestic Consumption & Exports
Motor Fuel-Prod & Imports
Price Gasoline 58-60 U.S.M. below 57 Octane/Gravity 57-for 57-64 octane add ¼¢ per gal for above 65 octane add ½¢ per gallon
Cents per Gallon
Thousands of Barrels
Stocks of Natural Gasoline
Stocks of Motor Fuel at Refineries, at Terminals and in Transit

Crude oil production and runs to stills until the order of the Federal Oil Administrator, therefore, exceeded by 600,000 bbl. and 250,000 bbl. per day respectively the economic requirements as determined by Statistical Sub-Committee of the American Petroleum Institute, and thus were directly responsible for the continuation of low prices for crude oil and motor fuel up to the time of Federal intervention.

Motor Fuel Demand Steady

INDICATED adjusted* domestic demand for motor fuel during June and July, 1933, averaged 1,184,500 bbl. per day, an increase of 7.94 percent over the daily average during May, 1933; 16,000 bbl. per day above the adjusted* domestic motor fuel consumption in June and July of 1932, an increase of 1.37 percent; and 102,500 bbl. per day under domestic motor fuel consumption in July of 1931, the peak year, a decline of 7.95 percent. Domestic motor fuel demand thus indicates the continued improvement over the corresponding months of 1932; whether it will further improve is problematical in view of recent advances in retail motor fuel prices amounting to 30 percent, and because of marked slowing up of business activity, which, as indicated by the New York Times weekly index (without cotton forwardings factor), lost about one-fifth of the ground gained since March, 1933.

The daily rate of exports of motor fuel averaged 107,000 bbl. in July, 1933, an increase of 23.0 percent over the preceding month; an increase of 40.4 percent over July of 1932; but 25.8 percent under July of 1931.

Total daily adjusted demand for motor fuel in July, 1933, therefore was 1,291,500 bbl., an increase of 3.78 percent as compared with the adjusted total daily demand in July of 1932; but 9.75 percent under July of 1931, the year in which motor fuel demand was at peak.

On August 1, 1933, motor fuel stocks at refineries, terminals and in transit amounted to 54,063,000 bbl., a decrease of but 518,000 bbl. as compared with stocks on hand on July 1, 1933, indicating that during July motor fuel demand exceeded supply by only 16,700 bbl. per day. Motor fuel stocks at the close of July, 1933, were 2,368,000 bbl. in excess of the limit recommended by the Statistical Sub-Committee of the American Petroleum Institute; while the preliminary figures to the end of August suggest a further divergence of 5,910,000 bbl., thus indicating that during the current year the motor fuel stocks remained at an uneconomically high level, and were not drawn upon to any appreciable extent at the height of the consuming season. On August 1, 1932, total motor fuel stocks amounted to 62,181,000 bbl., indicating that in the past year comparable storage has been reduced by 8,118,000 bbl.

***In 1932 and 1933 the June and July figures are averaged because of large reserve accumulation of motor fuel by distributors in anticipation of the Federal one-cent and one half-cent excise taxes made effective in June of 1932 and 1933 respectively.**

Prices Sharply Higher

QUOTATIONS on crude petroleum and all its products moved sharply up early in September influenced by the promulgation of the Code of Fair Competition on September 2 and by federal control of crude oil production made effective September 8.

Tank wagon/service station prices of motor fuel were increased throughout the country during the first half of September, and by the middle of the month motor fuel was quoted 1.8 cents up in New York and New England, ⅗ of a cent up in Pennsylvania and Delaware, 1 cent up in Ohio, 2 cents up in all Great Lakes, Middle Western and Southern states and 1.5 cents up in the Pacific and Rocky Mountain states. The more important advances and their dates were:—on September 6 the Standard Oil Company of California advanced tank wagon/service station prices of motor fuel 1.5 cents a gallon throughout its territory; on September 7 the Standard Oil Companies of Indiana and Nebraska advanced prices 0.5 cents a gallon throughout their territories; on September 8 the Standard Oil Company of New Jersey, including its Louisiana subsidiary, advanced prices 1 cent a gallon throughout its territory; on September 9 the Standard Oil Companies of Indiana and Nebraska again advanced prices 1 cent a gallon; between September 8 and 14 the Magnolia Petroleum Company (Socony-Vacuum) advanced prices 2 cents a gallon; and on September 12 the Standard Oil Company of New York (Socony-Vacuum) advanced prices 0.5 cents a gallon. The Imperial Oil, Limited, advanced tank wagon/service station prices of motor fuel 1 cent a gallon on September 11. New service station prices for motor fuel, regular grade, in representative districts were established at 18.0 cents in New York, at 17.8 cents in Chicago, at 18.0 cents in Ohio, at 20.5 cents in San Francisco, at 19.5 cents in Oklahoma and at 27.0 cents in Montreal, Canada, with 2-cent differential for the premium grade.

On September 2 the Standard Oil Company of New Jersey, the Standard Oil Company of Ohio and all other companies eliminated the 2-cent cash discount from the posted credit service station prices in compliance with the Code of Fair Competition.

Refinery gasoline quotations during September advanced from 50 to 60 percent above August prices. On September 21 refinery gasoline was quoted at 4¾–5¼ cents per gallon for 58–60 U.S.M. grade, 57 and below octane rating in Group 3, Oklahoma market; 57 to 64 octane rating, U.S.M., brought 5½ cents per gallon; and 65 and above octane rating, U.S.M., commanded 6 cents per gallon. On the East Coast, at Bayonne, the U.S.M. grade, 57 to 64 octane rating, was quoted at 6¼–6½ cents per gallon. Gulf Coast prices for export on September 21 were 5 cents per gallon for 58–60 U.S.M. grade, ¾ of a cent higher than during the preceding month.

Natural gasolines advanced sharply and were quoted at 5 cents per gallon for grade 26–70 in Oklahoma and North Texas, and at 5⅛ cents per gallon in North Louisiana.

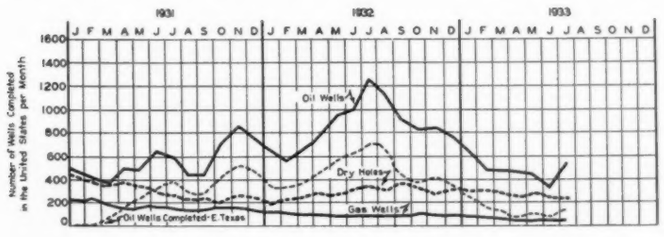
Kerosene prices advanced ¾ of a cent to one cent a gallon during September in the Mid-Continent markets. On September 21 grade 41–43 w.w. was quoted at 3¼–3½ cents per gallon in Group 3, Oklahoma market, and at 5⅜–5½ cents per gallon on the East Coast at Bayonne. Gulf Coast prices for export advanced fractionally to 4⅜–4½ cents per gallon for 41–43 p.w. grade.

Bunker oils participated in the general advance and on September 21 were quoted at $1.10 a barrel in New York Harbor, at 95 cents a barrel at Gulf Coast ports and at 85 cents a barrel at San Pedro, California.

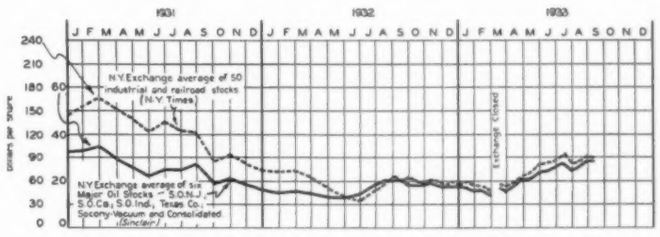
Posted crude oil prices in the Mid-Continent area were increased three times at the close of August and early in September. On August 25 all major companies posted a 10-cent per barrel advance, and it was followed by a similar advance on September 5 and by a 15-cent per barrel advance on September 8, bringing the total advance in 14 days to 35 cents per barrel, about a 65 percent increase for 36 gravity Mid-Continent crude oil. The increased prices indicate a current daily gross income from crude oil production in United States of about $2,350,000, from about 2,450,000 bbl. produced, as compared with about $1,000,000 obtained in May, 1933, from production of about 2,950,000 bbl. Particularly in East Texas current daily income of $425,000, from a production of 470,000 bbl., is in striking contrast to an income of $100,000 derived from a production in excess of 1,000,000 bbl. in May when East Texas crude oil brought but 10 cents a barrel.

The advanced crude oil prices will be sustained only if the production is maintained at levels ordered by the Federal Oil Administra-

U. S. drilling; comparison of oil wells, dry holes, and gas wells.



Six major oil stocks in relation to 50 industrial stocks on the New York Stock Exchange.


1931
1932
1933
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
240
210
180
150
120
90
60
30
0
60
40
20
0
dollars per share
N.Y. Exchange average of 50 industrial and railroad stocks (N.Y. Times)
N.Y. Exchange average of six Major Oil Stocks — S.O.N.J., S.O.Ca., S.O.Ind., Texas Co., Socony-Vacuum and Consolidated (Sinclair)
Exchange Closed

tor, particularly in accordance with limits set during the forthcoming winter months when it is anticipated that allowable production of the United States will be fixed at about 2,100,000 bbl. per day. R. S. Ellison, president of the Stanolind Crude Oil Purchasing Company (Standard of Indiana) in announcing the higher crude oil prices summarized the situation as follows:

> The prompt compliance by the oil states with Secretary Ickes's order allocating production allowables encourages us to believe that progress will now be made toward balancing crude supply with consumptive demand. In view of this development, a better price to producers is warranted. To consolidate this gain in the production phase of the industry there will, of course, have to be strict observance in all oil fields of the federal and state orders fixing the permissible production. We believe producers will realize this fact and cooperate whole-heartedly in the efforts now being made to improve conditions in the industry.

Crude Oil Prices

(Dollars per Barrel)

		July 6–Aug. 3 1933	Aug. 25–Sept. 8 1933
Oklahoma, N. Texas and Kansas	28 deg.	80.38	80.73
	36 deg.	54	89
	40 deg. top	62	97
East Texas	flat	50	90
West Texas	flat	30	60
Gray Co., Texas	40 deg.	46	81
Gulf Coast	25 deg.	44	81
	30 deg.	54	91
	34 deg.	62	99
Conroe	40 deg. top	69	1.09
Smackover, Ark.	flat	30	60
Rocky Mountains:			
Salt Creek	36 deg.	54	89
Elk Basin	flat	72	1.07
Pennsylvania:			
Bradford Distr.	flat	2.00	2.35
Eureka Lines	flat	1.62	1.97
Mt. Pleasant, Mich.	flat	80	90

		June 26 1933	Sept. 6 1933
California:			
Santa Fe	34 deg.	$1.02	$1.19
Kettleman Hills	39 deg.	88	1.11

The future course of prices for petroleum products depends upon balancing supply with the demand, upon the government price fixing program and upon inflationary developments in the United States, all three factors being at present indefinite. An interesting consideration is that with the American dollar now being worth but 60 cents in terms of gold, prices for crude oil and its products are actually 40 percent under the current postings; thus 36 gravity Mid-Continent crude oil was quoted on September 21 in terms of gold at 53.5 cents a barrel and refinery gasoline, U.S.M. 57 to 64 octane rating grade, in Group 3 market, at 3.3 cents a gallon, as compared with 89 cents and 5½ cents respectively actually posted.

NRA and Oil Industry

THE OIL CODE for the petroleum industry became effective September 2. As indicated in the preceding issue of WORLD PETROLEUM (page 271) the Code gave the federal government authority to control production, to fix prices and to enforce fair practices in marketing; the Code also included general provisions for minimum rates of wages, varying with different sections of the country, and for maximum hours of work per day and per week.

In conformity with the Code, President Roosevelt appointed Secretary of the Interior Harold L. Ickes the Federal Oil Administrator. On September 15 Secretary Ickes announced the appointment of a Petroleum Administrative Board to aid him in supervising the industry, to perform such duties as the Administrator may delegate to it. The new board is composed entirely of government officials and consists of:—Nathan R. Margold, Solicitor of the Department of Interior, chairman; Charles Fahy, ranking Assistant Solicitor of the Department of Interior, vice chairman; Norman L. Meyers, Assistant Solicitor of the Department of the Interior, secretary; J. Howard Marshall, Assistant Solicitor of the Department of Interior and special assistant to the Attorney General; Edward B. Swanson, chief of the Petroleum Economics Division of the Bureau of Mines; and Dr. John W. Frey, Petroleum Specialist of the Minerals Division of the Bureau of Foreign and Domestic Commerce. J. Elmer Thomas, petroleum analyst of Fort Worth, Texas, was appointed as technical advisor to the Petroleum Administrative Board.

To insure prompt cooperation of the oil industry with the Federal Oil Administrator there was appointed by the government the Planning and Coordinating Committee, nine sub-committees and also regional and state committees consisting of representatives of all branches and factions of the industry.

The first order of the Federal Oil Administrator was issued on September 2, and read:

"Pursuant to the provisions of . . . the Code of Fair Competition for the petroleum industry . . . the current estimate of required daily production of crude oil to balance consumer demand for petroleum products has been found by the Department of the Interior to be 2,409,700 bbl. and the allocations among the several petroleum-producing states are hereby certified to be as follows:

Texas	975,200 bbl.
Oklahoma	540,000 bbl.
California	480,000 bbl.
Kansas	111,000 bbl.
Louisiana	70,000 bbl.
New Mexico	41,400 bbl.
Michigan	30,000 bbl.
Arkansas	29,000 bbl.
Rocky Mountains	38,900 bbl.
Wyoming 30,050 bbl.	
Montana 6,450 bbl.	
Colorado 2,400 bbl.	
Appalachian states	94,200 bbl.
Pennsyl. 36,200 bbl.	
Kentucky 12,000 bbl.	
Ohio 12,000 bbl.	
Illinois 12,000 bbl.	
West Va. 11,000 bbl.	
New York 9,000 bbl.	
Indiana 2,000 bbl.	

"The foregoing allocations shall be effective under the aforesaid code of fair competition as of 7 A.M., September 8, 1933."

"It is hereby ordered that in accordance with Section 2 of Article 3 of the aforesaid code, until further notice there shall be no net withdrawals from storage without the approval of the Planning and Co-ordination Committee and upon the order of the Administrator."

"It is hereby further ordered that in accordance with Section 1 of Article 3 of the aforesaid code, until further notice, imports of crude petroleum and petroleum products shall be limited to an amount not exceeding the average daily imports of petroleum and petroleum products during the last six months of 1932."

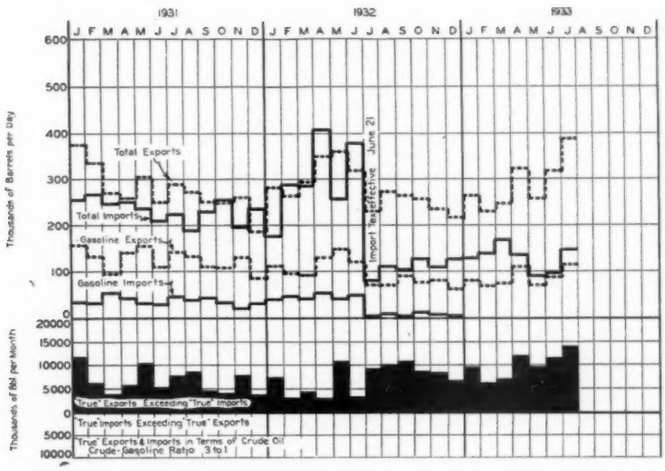
All states, with the exception of Texas, immediately accepted the Oil Administrator's allowables. The Texas Railroad Commission, however, requested that Texas be temporarily exempted from the new order reducing production, stating that more time was necessary under state laws. Secretary Ickes suggested that the Railroad Commission should issue a temporary order and indicated that failing such action the federal government would be required to allot to the various Texas fields what each should produce. Following the receipt of the Oil Administrator's reply the Texas Railroad Commission ordered a blanket 25 percent reduction for all Texas oil fields, thereby complying with the order.

Effects of Federal Production Order on Principal Oil Producing States

	Daily Average Production Week Ending Sept. 9 bbl.	Daily Average Allowable Production Under Order bbl.	Daily Average Production Week Ending Sept. 16 bbl.
Texas	1,247,254	975,200	986,467
East Texas	636,558		470,000
Oklahoma	513,860	540,000	564,640
California	513,000	480,000	490,000
Kansas	127,375	112,000	130,000
U. S. A.	2,715,601	2,409,700	2,482,386

The accompanying table indicates that in general all states conformed with the federal order, total daily production having been reduced by 305,901 bbl. in the week ending September 16 as compared with the preceding week, though still being 72,686 bbl. in excess of federal allocation, local excesses being due only to temporary delays. A number of states seriously objected to their reduced allowables. At a hearing held by the Texas Railroad Commission on September 16, nominations of purchasers for crude oil were made for 1,212,514 bbl. per day, or 237,314 bbl. per day in excess of the federal allotment; in Kansas operators indicated that their markets can absorb 20,000 bbl. in excess of their allowance, and in other states similar objections were raised. It is anticipated that current federal allowables will be generally adhered to, though considerable difficulties are expected when the Oil Administrator orders reduced allowance for winter months, which is expected to total 2,100,000 bbl. per day effective October 1. A test case in federal courts and forcible federal enforcement are more than probable during October or November, particularly because Secretary Ickes is anxious for exemplary action.

Another difficult problem has arisen in connection with the renewal of gasoline price wars in certain localities. Such underselling flared up in California, Houston, Texas, and Brook-


1931
1932
1933
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Thousands of Barrels per Day
Total Exports
Total Imports
Gasoline Exports
Gasoline Imports
Import Tax Effective June 21
Thousands of Bbl per Month
"True" Exports Exceeding "True" Imports
"True" Imports Exceeding "True" Exports
"True" Exports & Imports in Terms of Crude Oil
Crude-Gasoline Ratio 3 to 1

Total U. S. imports and exports and gasoline imports and exports in relation to true exports exceeding true imports.

lyn, New York, though it was eventually brought under control in California and in Houston. On September 21 the Federal Oil Administrator ordered criminal prosecution for violations of the oil code under the following Section:—

> The President may impose such conditions (including requirements for the making of reports and the keeping of accounts) for the protection of consumers, competitors, employees and others, and in furtherance of the public interest, and may provide such exceptions from the provisions of this code as the President in his discretion deems necessary to effectuate the policy of the National Industrial Recovery Act; provided that all such matters shall first be considered and recommendations made in regard thereto by the Planning and Coordinating Committee.

It was understood that the first prosecution of underselling would be undertaken in Brooklyn, New York, area.

Simultaneously Secretary Ickes issued a direct appeal to the consumers for public support of the Oil Code, asking the users of motor fuel not to purchase products sold at cut-rate service stations.

The price-fixing section of the code, which was objected to by a large section of the oil industry, was deferred temporarily pending developments. Federal authorities, however, indicated that unless prices for crude oil and its products improve to levels insuring reasonable profits, or if they far exceed those levels, price fixing will be resorted to. The price fixing problem may be summarized by stating that if federal production orders, balancing supply with demand, are obeyed, or enforced, prices will be automatically adjusted to profitable levels, but if federal orders prove non-enforceable, which does not appear probable, federal price fixing will be equally non-enforceable, causing another price debacle, and with it complete demoralization of the oil industry. The energetic and prompt actions of the Oil Administrator indicate that the federal government will do all in its power to insure compliance with the Code.

The usual complications of the inflationary periods were being felt by the oil industry by the middle of September. The general increase in prices of motor fuel was strenuously objected to by large groups of consumers accustomed in the past years to extremely low prices. Statements were issued by various associations that motor fuel prices were raised far in excess of wage increases, and that the increases in motor fuel quotations to-date meant an additional annual burden on the public of $486,000,000, or of $648,000,000 if the prices are further increased to $1.11 per barrel for 36 gravity Mid-Continent crude oil as was originally suggested by the Planning and Coordinating Committee.

Texas Pipeline Rates Cut

THE TEXAS Railroad Commission on September 5 ordered a 22.5 percent reduction in pipeline rates effective December 1, 1933, and affecting all common carrier pipelines operating in Texas in intra-state transportation. The reduced pipeline rates were approximately the same as the rates proposed by the pipeline companies at the hearing held in Austin on August 30. It is estimated that the reduction in rates will save the shippers some $29,000,000 annually.

Additional ruling stated that the new rates are in force for all pipelines and that lower competitive tariffs will not be permitted; and that pipelines are allowed shrinkage deductions of one percent for the gathering system and of one percent for the trunk line, as compared with former authorized deductions of two and one percent respectively.

Texas Gathering and Trunk Line Rates Effective December 1, 1933

	Cents per Barrel
From East Texas to Houston, Texas City, Beaumont and Port Arthur	22.5
From West Texas to Houston, Texas City, Beaumont and Port Arthur	37.5
From Panhandle to Houston, Texas City, Beaumont and Port Arthur	47.5
From Conroe to Houston, Texas City, Beaumont and Port Arthur	20.0
From Pettus to Corpus Christi	25.0
From Refugio to Corpus Christi	20.0

East Texas

FIELD activity in the East Texas field continued at an accelerated pace during September with about 70 completions and 70 new locations each week. The Texas Railroad Commission issued a new order which, it is hoped, will prevent further over-drilling of small tracts in the field. The order states that "no permits to drill an oil well shall be allowed until notice of hearing has been given by the Commission."

The fast drop in bottom-hole pressures in the East Texas field has been arrested with the reduction of production in July, and the subsurface conditions are apparently slowly improving. At the present time the average bottom-hole pressure in the pool is about 1,200 lbs. The encroachment of salt water on the western side of the field, however, has shown signs of acceleration and currently about 500 wells are making water, 4.55 percent of all wells in the field, the total water production being estimated at around 20,000 bbl. per day.

Anderson County — East Texas

ANOTHER major oil field in the Woodbine sand, responsible for flush production in East Texas, Van and Mexia Fault Zone fields, appeared very likely when Tide Water Oil Company and Texas Seaboard Oil Company No. 1 Monning (Long Lake Plantation), located about 50 miles southwest from the south end of the East Texas field, tested 40,000,000 cu. ft. of saturated gas per day from the upper section of Woodbine sand topped at 5,147 ft. and penetrated to 5,229 ft. No. 1 Monning is located on a large block of 25,000 acres controlled jointly by the two companies, thus insuring conservative development in the case of discovery of oil production.

Development of oil production in the above wildcat will presage the opening of a pool similar to Van, small in areal extent, but with thick sand section and very large reserves. No. 1 Monning was located on the basis of geophysical seismographic survey.

Tomball — Gulf Coast

DURING August and September the Tomball field was further defined and was definitely eliminated as a major pool possibility. Much of the capital expenditures made in the new pool even before the actual discovery of oil and including large lease and royalty accumulations by many companies, three trunk pipelines, storage tanks, camps and roads will be far in excess of the actual requirements of the few wells already completed and yet to be drilled.

Though the deep seated salt dome located by the seismographs was proved by the subsequent drilling operations, subsurface conditions within the Cockfield formation, which produces in the recently developed Conroe field, the largest Gulf Coastal pool, were found to be so unsatisfactory as to exclude the possibility of a major oil field in the area tested to-date. Two factors were responsible for the absence of major oil accumulation:— (1) the water level in the Tomball was found at minus 5,391 ft., whereas the oil-gas contact was found to vary from minus 5,344 to minus 5,360 ft., thus leaving only 31 to 47 ft. of sand section that could be oil saturated; but (2) even within that thin section sands are very thin and highly irregular, and therefore the oil accumulation is spotted and varies from location to location, with a considerable portion of the structure apparently entirely devoid of

sand bodies within the oil zone, between minus 5,391 ft. and minus 5,344 ft., and therefore non-productive of oil.

To the end of September seven oil and three gas wells have been completed in the Tomball field with a total potential of about 5,000 bbl. per day, and the pool has been fairly well defined as an area of about 4,000 acres. Additional development in the Tomball field will be very slow and much more careful and but few more wells are expected to be drilled within the current year. On the other hand forced conservatism of future development and very wide spacing of wells will, over a long period of time, make Tomball profitable to operators, even if not a factor in the national oil industry.

The possibility of deeper producing formations in the Tomball field at this writing is rather small, because two outside wells, the Magnolia Petroleum Company's (Socony-Vacuum) No. 1 Martens and the Humble Oil and Refining Company's (S.O.N.J.) No. 1 Gebhardt, were drilled to 7,245 ft. and 6,572 ft. respectively without finding encouraging sand sections.

Greta — South Gulf Coast

DEVELOPMENT of Greta field in Refugio County was greatly accelerated during September, and by October 1 there were in this new pool 30 producing oil wells with an estimated potential of about 40,000 bbl. per day, and around 50 active operations, with new projects increasing to 20 each week. The Texas Railroad Commission is expected to issue shortly a proration order on acreage basis for the Greta pool, as was requested by the operators themselves. The Commission already regulated the spacing of wells to one well to 20 acres, though in actual practice the operators drill but two wells on each 50-acre tract.

The Greta field has been proven productive to-date over an area of about 2,250 acres, with a possibility that 5,000 acres may eventually produce. Structural and sand conditions in Greta are unusually uniform with the top of sand (Marine Tligocene) encountered at about 4,360 ft. and water level of about 4,405 ft., with 35 ft. of saturated sand. There is no gas cap in the new pool so far, all gas being held in solution. Total recoverable reserves of the new field may be estimated in a preliminary way at about 75,000,000 bbl. from 5,000 acres.

Central Oklahoma

THE CURRENT potential open-flow tests in the Oklahoma City field indicate a sharp drop in production as compared with the potential production of April, 1933. The 4-hour tests on 238 Wilcox sand wells tested up to September 21 indicate a 37 percent drop in oil flow, and a 47 percent decline in gas volume, indicating an approximate 0.301 percent daily decline in potential production. Considering that the April–May, 1933, tests showed a decline of 48 percent in the potential production of the Wilcox sand wells in the Oklahoma City field, as compared with preceding tests, the conditions in the pool may be regarded as not conducive to much longer flowing life. The radical decline in the potentials of Oklahoma City field may be directly attributed to the excessive daily allowable production, which at times during the last four months exceeded 350,000 bbl. per day, with resulting wastage of natural gas.

The Lucien field assumed more important proportions with completion of three additional oil wells, all in already proven territory. Shell Petroleum Company No. 1 Schoenwald in section 20–T2ON–R2W was completed for 11,000 bbl. per day from the Wilcox sand with total depth of 5,145 ft., and Lucien Consolidated Company's No. 1 J. Boley and No. 1 Magney were being completed at the close of September. To-date eight oil wells were completed in the Lucien pool and six wells are actually drilling, while six dry holes defined the field on the east and west sides. Potential production of the field is estimated at 40,000 bbl. per day and its allowable under orders of the Corporation Commission is 6,832 bbl. per day. The Lucien pool, as proven to-date, is 1¼ miles wide and 3½ miles long, covering an area of some 2,900 acres.

Elwood — California

THE FORTHCOMING development of the Sespe formation in the Elwood field of Santa Barbara County, as reported in the preceding issue of WORLD PETROLEUM, has been delayed by the order of the Central Proration Committee which requested that the operators must first formulate a definite development program, before the Committee will permit production from the Sespe.

Michigan

THE ACTIVE development of Central Michigan oil fields continued to increase the potential production of Michigan to record figures. By the end of September the potential production of the state reached 44,000 bbl. per day, of which 32,000 bbl. was in the Porter field discovered in February of 1933. The Oil and Gas Producers Association of Michigan issued during September an order prorating Porter field to 19,200 bbl. per day, a 60-percent allowance.

In the Oceana County field, discovered this summer, and located north of old Muskegon pool a fourth oil well was completed in the Upper Traverse limestone, H. C. Nelson's No. 1A Doolittle which after acid treatment increased from 125 bbl. per day to 75 bbl. per hour, and which was expected to settle to around 400 bbl. per day.

The most active drilling campaign the state of Michigan has ever witnessed is now under way. The Porter field is leading with about 50 producing completions since March and with around 50 wells drilling; the Vernon area, recently proven for flush production, has 25 wells drilling, while development in Oceana and Ogemaw Counties is proceeding more slowly. The wildcatting in Michigan is similarly spreading over a wide territory, encouraged by recent discoveries in Oceana and Ogemaw Counties.

BASIL B. ZAVOICO

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British Imports Increase Over 1932

IN NEARLY every important category, as well as in the total, imports of petroleum for the eight months to August 1933 show an increase over the corresponding figures for 1932. The outstanding exception in which the current eight months' total registers a decline in volume is kerosene, imports at 3,355,449 bbl. being about 18 percent below those for the first eight months in 1932. It seems probable that the steady extension of electric lighting facilities to rural districts, now proceeding under the "Grid" scheme, is having marked effect in replacing oil lamps by electric light. It is possible, also, that the persistence of abnormally fine weather for some months past has reduced domestic consumption which, authorities state, accounts for nearly one-half of the kerosene used in Britain.

Motor spirit at nearly 21,500,000 bbl. and gas oil at approximately 2,200,000 bbl. imported during the first eight months of this year each shows an increase of about 12 percent over the comparable period in 1932, while imports of lubricating and fuel oils also show some slight expansion. At the same time, imports of crude for the eight months' period rose from 7,158,316 bbl. in 1932 to 7,574,849 bbl. in 1933.

Petroleum Imports into Great Britain

(Barrels)

	Month of August 1933	Eight months to August 31, 1933	Eight months to August 31, 1932
Lamp oil	357,410	3,355,449	4,095,128
Motor spirit	2,719,115	21,439,804	19,131,065
Other spirit	57,663	304,145	320,701
Lubricating oil	185,530	1,831,872	1,816,427
Gas oil	320,236	2,195,026	1,964,879
Fuel oil	1,206,460	10,037,712	9,968,936
Other sorts	1,255	5,483	17,797
Total products	4,847,669	39,169,491	37,314,933
Crude	779,094	7,574,849	7,158,316
Total imports	5,626,763	46,744,341	44,473,249

Comparison of the imports for the month of August in each of the two years, 1933 and 1932, gives results which are in many respects inconsistent with those for the eight months' periods. The incidence of imports during the past eight months has evidently changed. For instance, imports of motor spirit in August 1933, at 2,719,115 bbl., were more than eight percent below the August 1932 total, but despite this the eight months' total shows a 12 percent increase.

A notable decline in imports during August 1933 occurred in fuel oils.

RUSSIA

Official Figures For Soviet Oil Operations

	Crude Production (Bbl.)	Daily Average (Bbl.)	Run to Stills (Bbl.)	Drilling (Ft.)
January	10,382,400	334,917	9,510,900	157,486
February	10,162,600	362,950	9,167,900	169,396
March	11,928,700	384,800	11,003,300	228,532
April	11,824,400	394,150	10,472,700	228,790
May	12,794,600	412,729	11,834,900	213,744
June	12,489,400	416,313	11,641,700	198,729
July	11,837,000	394,567	10,887,800	214,385
August	.....	.....	.....	.....
Total 8 months 1933	.....	.....	.....	.....
Total 8 months 1932	104,267,500	429,085	98,957,580	1,741,445
Revised quota 1933	170,800,000	467,670	155,000,000	3,315,000

Crude oil conversion ratio 7 bbl.—one ton

Baku Advances

THE OILFIELDS of Baku are being looked to for the salvation of the Second Five Year Plan for the Soviet oil industry during 1933, as these fields continue to register improvements while Grozni and other Russian fields find increasing difficulty in keeping pace, not only with the tempo of the plan, but even with the production records set in preceding years. During the second half of August Baku increased production to 336,000 bbl. daily against 300,000 bbl. daily during the first half of the month and 270,000 bbl. during July. Baku provided 9,797,400 bbl. of the total of 11,111,111 bbl. produced by all Russian fields during August.

Intensive development of Lok Batan, Kala and Zulu-Tepe is largely responsible for the improvement shown in Baku production which contrasts with the poorer showing of Grozni and other Soviet oil trusts. Opening of these fields has led to gusher production at Baku exceeding the plan by almost 100 percent. Difficulty, however, is still being experienced with pumping and compressor production, even at Baku.

Leading Soviet papers place the responsibility for arrears in the other trusts on the lack of skilled technical supervision, failure of adequate supplies of equipment, and the tremendous turnover of labor, factors to which WORLD PETROLEUM has referred frequently. Labor difficulties have been emphasized particularly because of the wage scale for drillers which affects localities requiring deep drilling; higher rates being paid for shallow drilling than for the more complicated deep drilling. Because of the simpler drilling problems and better living conditions Baku has been fortunate in obtaining better labor and avoiding time-consuming breakdowns due to unskilled drilling and poor equipment.

Practically all Soviet oil production is now coming from Baku, Grozni, and Maikop; all other Soviet fields furnishing approximately five percent of the daily average crude production. The position of these three trusts is important in studying the efforts being made by the Soviet government to concentrate the industry's best efforts on Baku production.

Daily Production of Leading Soviet Oil Trusts

(Barrels per Day)

	Planned Production for Third Quarter 1933	Actual Production	Percent of Plan Fulfilment
Azneft (Baku)	308,000	316,000	102
Grozneft	129,500	96,900	74
Maikop	21,000	13,300	63

The government and, even more important, the Central Committee of the Communist Party are considering plans for increasing still further the production from Baku. At Lok Batan, Kala and the Island of Arten, 300 wells are to be brought under operation before the end of this year. Over 40 of these have already been started and others will begin as quickly as the necessary equipment arrives. Assistant Commissar for Heavy Industries Piatakoff has issued orders to rush 150 drilling outfits to Baku and every effort is being made from Moscow to supply necessary equipment.

The authorities, however, have no illusions about the difficulties that confront Baku in her attempts to compensate for the arrears originating in other fields of the Union. Domestic machine shops may not be able to supply adequate equipment for necessary deep drilling, and skilled labor for this division must be trained quickly. Attention is being concentrated on Baku and all second year oil students have been ordered for practice to the fields.

Another extremely practical step is being taken in sending a commission of Soviet oil men to the United States to study drilling technique. This commission should arrive in the near future, and plans not only to study drilling practice but to consider engaging skilled American drillers for work at Baku. The authorities are considering the purchase of drilling equipment in the United States to supplement the production of Russian plants.

"Arrears of Grozneft"

A TOTALLY different picture exists at Grozni, second most important Russian group of fields. M. Ganshin, a leading Soviet oil man, writing in ZA INDUSTRIALIZATIU under the above title points to the need for reorganization of Grozneft to eliminate the lack of order that has resulted in a huge labor turnover, frequent breakdowns and the poor record turned in by Grozni for 1933. M. Ganshin refers to the inequitable wage scale for deep drilling, by which drillers receive 181 Rbl. monthly for drilling at depths to 2,500 ft. 177 Rbl. for depths between 2,500 ft. and 3,000 ft.; and 165 Rbl. monthly for drilling at depths below 3,000 ft. Frequent breakdowns are due to lack of skilled technical supervision and inadequate equipment, and the high rate of labor turnover is responsible for the general lack of enthusiasm.

Drilling speed of 78.6 meters per rig per month compares most unfavorably with the average speed of 81 meters per rig per month attained in 1932 and the requirements of the plan which calls for 133 meters per rig per month in 1933.

ZA INDUSTRIALIZATIU closes M. Ganshin's remarks with a brief criticism of the author in which the paper asks what M. Ganshin has done to improve conditions at Grozni.

Although plans are under consideration for improving conditions at Grozni, no such definite action as that taken in r gard to Azneft is apparent and, as all efforts are now designed to save the oil plan for 1933 by concentration on fields where the greatest immediate results can be obtained, it is probable that the tremendous task of reorganizing Grozneft will be put over till well into 1934.

Exploration

A GUSHER flowing 35,000 bbl. of crude per day from 3,500 ft. has been brought in at Buktha Bay in the Baku group of oil fields. After a few hours of high pressure flow the equipment gave way and the well flowed into the open while efforts were being made to bring it under control.

Flowing 42,000 bbl. from 3,000 ft. a well has been brought in at Puta and another at Kiroff flowing 7,000 bbl. belonging to the Baku group. Both wells have been brought under control.

A 7,000 bbl. per day well at Ordzonikidze has gotten out of control and formed a lake about the base of the drilling rig while over 100 operators are attempting to bring the well under control. Altogether seven new wells in the Ordzonikidze group have been brought in during August increasing average daily production of Baku by 45,000 bbl. Several new wells have been completed as producers in the Stalin group of fields and in the Zulu-Tepe and Lok Batan areas where intensive drilling is under way.

Two wells flowing together 15,000 bbl. daily from 2,500 and 3,500 ft. respectively have been

completed in Kala. This new field is also being intensively developed by 24 rotary drilling rigs. At present it produces about 22,000 bbl. daily. At least 20 new wells are expected to be completed during September.

At Grozni, in the Molgabek field, a gusher flowing 7,000 bbl. in the first hour and a half was recently completed. The well is producing from 3,500 ft. a light grade crude.

Exports

TOTAL exports for July show a marked falling off and continue the trend established during the first six months of this year. During July, 1933, 3,150,000 bbl. of petroleum and products valued at 6,100,000 Rbl. were exported against 5,138,000 bbl. valued at 12,290,000 Rbl. exported in July, 1932. For the seven months ended July 31, 1933, 22,209,061 bbl. valued at 51,510,000 Rbl. were exported compared with 25,322,401 bbl. valued at 59,990,000 Rbl. in the like period of 1932.

Soviet Oil Exports by Products

(Barrels)

	Seven Months 1933	Seven Months 1932
Crude Oil	820,400	1,074,381
Gasoline	7,099,184	9,410,992
Kerosene and Ligroin	3,323,851	3,593,838
Solar and Gas Oil	2,586,507	2,451,505
Lubricating Oil	1,040,865	833,812
Diesel Oil	442,820	222,873
Fuel Oil	6,895,434	7,735,000
Total	22,209,061	25,322,401

Soviet Oil Exports by Countries of Destination

(Barrels)

	Seven Months 1933	Seven Months 1932
Italy	4,579,232	4,268,026
France	3,236,163	4,457,894
Germany	2,129,407	2,157,449
England	1,578,612	1,648,976
Spain	1,438,612	1,648,976
Belgium	1,165,402	1,336,146
Sweden	1,129,016	1,005,018
British India	866,971	814,793
Egypt	661,976	1,039,192
Denmark	528,983	435,575
China	490,658	364,245
Holland	346,220	286,790
Japan	355,054	611,520
All Other	3,702,755	5,247,801
Total	22,209,061	25,322,401

In the accompanying table of Soviet oil exports by countries of destination, 490,000 to 525,000 bbl. of fuel oil delivered to the French navy are not included.

Completions

THE FIRST shipment of oil from Uktha by barge down the Izme River has recently been completed. Uktha produced 1,500 bbl. of crude in 1931, 8,000 bbl. in 1932 and is expected to produce 85,000 bbl. in 1933. New producing regions are reported between the Koshva and Viya Rivers and this region may produce barium, iodine and chlorium salts.

The recently completed Chussoff Village refinery has shipped its first load of 400 bbl. of treated gasoline.

Changes in Personnel

M. CHAMROFF, former head of Grozneft who has been replaced by Konstantin Riabovol, has been appointed assistant to M. Ganshin, head of the Glavneft. M. Yefuni, former assistant to M. Riabovol at Soyusnefteexport, has been appointed head of Soyusneftorg.

J. WEGRIN

MEXICO

President's Annual Message

IN HIS annual message to the 35th session of the Federal Congress President Abelardo L. Rodriguez again stressed the necessity of following a program in regard to the nationalization of Mexican petroleum reserves in such a manner as to form a fixed reserve for emergencies and to prevent monopolies, to establish a Mexican company for exploitation of existing reserves and to regulate production in accordance with the interests of the public and the nation. The President mentioned, however, that such a program was being initiated with due regard for the rights of existing concessions. He pointed out that full control of the petroleum industry was difficult because 97 percent of the present exploitation was controlled by foreign capital, principally two groups of foreign companies. A program leading to the realization of the full benefits of Mexican petroleum reserves for Mexico was being initiated, however, as indicated by the decree of May 19 extending as government reserves 100 kilometers along the coasts and international boundaries. The President pointed out that this decree in no way hindered development by private initiative, applying as it did to zones in which no concessions had been granted. He also called attention to the construction of a small refinery by the Administrative Control of National Petroleum (a federal government agency) which marked a step in the direction of developing Mexican resources by Mexican capital and for Mexican interests.

MEXICAN official circles deny that a general commercial treaty with the United States is being sought but Mexico is endeavoring to obtain greater facilities for shipping heavy petroleum and certain agricultural products into the United States over the Rio Grande.

Exports Increase

WITH THE exception of March and April, exports of Mexican petroleum in the first half of 1933 have run ahead of corresponding months in 1932 according to the Ministry of Finance. Total exports for the first half of 1933, however, were only 10,219,280 bbl. compared with 13,403,145 bbl. in the same period of 1932; this the Ministry ascribes to efforts of Mexican exporters to ship petroleum and products into the United States before the 1932 import tax became effective, 6,080,304 bbl. being shipped in the months of March and April 1932. At present, exports to the United States have fallen to but 30 percent of those in the first half of 1932 but have increased to other countries.

The special taxations department finds that there has been a slight falling off in government income realized from export taxes and production taxes on oil for export, the figure for the first half of 1933 being 3,274,395 pesos (approximately $1,000,000 U. S.) against 3,689,579 pesos (approximately $1,154,500 U. S.) during the comparable period of 1932.

Pipeline Fire

THE LIVES of three persons and property damage of over $30,000 resulted from a fire of undetermined origin which damaged a portion of the Mexican Eagle pipeline connecting that company's refinery near Mexico City and Palma Sola.

DOUGLAS GRAHAME

Wharf of the Bella Vista terminal, National Administrative Control on the Panuco below Tampico.

FINANCE

New York: September

DURING September occasional rumors of imminent new inflationary action by Washington vied with disappointment that basic industry failed to register normal seasonal improvement in the weeks immediately following Labor Day, with the result that the market displayed no uniform or decisive trend. The utilities gave the most unsatisfactory performance, being hampered by new taxes, current and prospective rate reductions, threatened government competition and a number of important dividend reductions and omissions. Industrials made the best record, but their action was far from uniform and the oils were favored on the whole more than any other single group. There was a rather sharp sell off just after the middle of the month, which had been preceded by a week of strong markets, and quotations on the average were lower than in the latter part of August and in rails and utilities fell below the low point of the July break.

The NRA and credit expansion continue to be the main reliance of the Administration and seem likely to be given further opportunity to prove themselves before resort will be had to more drastic inflationary action. Retail sales have been recording a better than seasonal performance (insofar as available statistics in this field seem to indicate), and the automobile industry has sustained its sales and production to a very encouraging degree. The steel industry continued throughout the month in its delayed seasonal recession, with some show of reviving in the last week and with further promise of improvement through government aid to the railroads for the purchase of rails and other equipment and through the Public Works program.

The oils have been favored by the constructive action of Secretary of the Interior Ickes as Administrator of the oil code. The prompt determination and allocation of allowable crude oil production under the code was followed by a sharp drop in output and substantial advances in crude prices. The full reduction of output to the 2,409,000 bbl. daily average specified in the order was not accomplished in September, and there is some uncertainty as to whether further reduction will not be imperative during the winter months if the price structure is to remain sound and strong. On the other hand, consumption is being distinctly benefited by the NRA, under which greater mass purchasing power is being combined with a more than normal amount of leisure time. The price fixing provisions of the code have not yet been invoked and may not be used if restriction of output proves adequate to support a reasonably satisfactory price structure. Oil company income statements for the third quarter promise to be the best of the year to date, but in many cases will not offset the deficits sustained in the first six months.

SUN OIL COMPANY, whose half-year earnings were commented upon in these notes last month, has released its June 30 balance sheet revealing its usual strong financial position. Current assets, including cash and marketable securities of $4,028,689, amounted to $23,267,330 and current liabilities were $6,642,985. A year previous cash and marketable securities were $3,254,340, total current assets were $24,322,522, and total current liabilities were $7,724,060.

MID-CONTINENT PETROLEUM furnished no exception to the general tenor of half-year earnings reports in the industry and reported a second quarter net loss of $1,233,538, bringing the half-year net loss to $2,703,466. The first half of 1932 yielded a loss of $731,894, but the second quarter of that year contributed a profit of $303,844. The loss this year included an inventory adjustment of $818,991 which can easily be recouped in an enlarged profit margin under the higher prices now prevailing and expected to continue over the coming year.

STANDARD OIL COMPANY of Kansas, which is now a crude operator having sold its refining business to Standard of Indiana, reported a net loss of $124,692 for the first six months of this year. Higher prices and increased demand in

The oil port of Hamburg, Germany, largest petroleum port in Europe a complete description of which is published on page 340 of this sssue.

New York Stock Prices

1933 High	1933 Low	Current Div. $ per Annum	Stock (Par Value $)	August 21 to September 16 Sales (Shares)	First	High	Low	Last	Net Change[1]
47	18½	2.00	Amerada (No)	182,900	36	47	36	45¼	+9¾
31⅞	12⅜	1.00	Atlantic Refining (25)	133,600	27⅝	31⅜	27⅝	30¼	+2⅞
11	3	....	Barnsdall (5)	204,000	8⅞	11	8¾	10¼	+1⅝
4	¼	....	Colon Oil (No)	14,900	2⅞	3⅛	2½	2⅝	....
15¾	5	....	Consol Oil (No)	523,900	12⅛	15¼	12⅛	14½	+2⅞
19½	4⅞	....	Continental Oil (5)	277,000	16¼	19⅜	15⅞	18¾	+3
8⅝	2¼	....	Creole Petroleum (5)	36,200	6⅞	8½	6⅞	7½	+ ½
62	24	....	Gulf Oil Corp. (25)	25,500	52½	60½	52½	57¾	+6¾
88	40	2.00	Humble Oil & Ref. (25)	17,800	76	87½	76	85½	+8½
15¼	6½	0.50	Imperial Oil, Ltd. (No)	25,600	14	14½	13⅜	13⅞	+ ⅜
19⅞	8⅞	§0.28	International Petr. (No)	65,600	17½	19½	17½	19	+1¾
16	3¾	....	Mid-Continent (No)	67,900	12⅜	15½	12¼	14¼	+2
17⅝	4¾	....	Ohio Oil (No)	206,200	13¾	17	13¼	16¾	+3¾
18¼	4¾	....	Phillips Petr. (No)	241,900	14⅝	18¼	14¼	18¼	+3⅞
13¼	2½	....	Pure Oil (25)	229,200	8⅞	13¼	8¾	13	+4
36½	17⅝	†6%	Royal Dutch N. Y. (133⅓)	15,700	31½	36½	31½	36⅜	+4⅜
36¾	15	‡0.60	Seaboard Oil (No)	138,600	25¾	36⅜	25¾	35¾	+10
11⅝	4	....	Shell Union (No)	100,900	8⅞	9¾	8⅜	9½	+ ⅛
12⅜	4⅞	0.25	Simms Petr. (10)	12,800	9¾	11½	9⅝	11¼	+ 2¼
9⅞	3	....	Skelly Oil (25)	12,800	7⅝	9⅜	7⅝	9	+ 2
15½	6	....	Socony-Vacuum (25)	312,700	12⅝	14¼	12⅛	14	+ 1⅞
42¾	19½	1.00	Standard Oil of Calif. (No)	143,100	37	42¾	36¾	42¼	+ 5⅛
33⅞	17	1.00	Standard Oil, Ind. (25)	101,200	29½	33⅞	29⅛	33½	+ 4¼
29½	12¾	....	Standard Oil, Kansas (25)	6,100	20½	29½	20½	29½	+ 8½
19¼	8⅜	1.00	Standard Oil, Ky. (10)	14,200	16¾	17⅝	16¼	17⅜	+ ⅞
42½	22¾	1.00	Standard Oil, N. J. (25)	276,100	38¼	42½	37¾	42⅜	+ 4⅞
50	35	*1.00	Sun Oil (No)	900	44⅛	47	43	46	+ 3
29⅞	10¾	1.00	Texas Corp. (25)	173,700	24	29⅞	24	29¼	+ 5½
10¾	3⅛	....	Tide Water Assoc. (No)	127,700	9½	10¼	8¾	9⅝	+ ⅜
23⅜	8½	1.00	Union Oil of Calif. (25)	68,900	19⅞	22¾	19½	22¼	+ 2¾
1½	⅛	....	Venezuelan Petr. (5)	11,000	⅞	1¼	⅞	1	+ ⅛

[1] Since close of last month's table. † Paid for 1932—no regular rate.
‡ Also 10c extra this year.
* Also paid 2% in stock for 1932.
§ Latest dividend—in Canadian funds.

the second quarter resulted in a much better showing for that period than for the first three months. The second quarter yielded a profit of $146,442 compared with a first quarter loss of $271,234. Comparisons with last year are not available.

COLONIAL BEACON OIL, New England subsidiary of Standard Oil (New Jersey), sustained a half-year net loss of $2,153,838 after all charges, compared with net loss of $1,120,806 in the corresponding period of 1932. The loss in the second quarter was somewhat smaller than in the first, being $927,317, but the improvement over the first three months was much smaller than that registered by the majority of companies. Even the June quarter of 1932 left the company in the red, whereas most oil companies showed a profit in that period.

THE RECEIVER'S report for Richfield Oil showed an operating profit for the first half of this year of $755,401 before depreciation and depletion. The total aggregate operating profit before these charges for the entire period of the receivership from January 15, 1931, to June 30, 1933, was $8,212,819.

Details of the offer of Standard Oil of California for acquisition of Richfield have been completed so that the offer now provides for payment of $17,500,000 of 20-year 6 percent debentures to be guaranteed by Standard, together with $6,000,000 of market value of Standard stock. As in the original offer additional payment up to $500,000 is allowed for reorganization expenses. The original offer specified, in addition to the debentures, 200,000 shares of Standard stock, then worth about $25 a share, or $5,000,000. This offer thus totaled $22,500,000 against the new total of $23,500,000; but if the present price of Standard stock were applied to the original offer its total value would be increased by well over $3,000,000. It is thought that Cities Service and perhaps Consolidated Oil may enter the negotiations for the company before a final solution is reached. Consolidated had previously submitted bids which were later withdrawn.

C. C. BAILEY

London: September

AMERICAN influences remain predominant in the oil share market, and have recently been responsible for a fresh upward movement in prices. In anticipation of the application of a business code to the United States oil industry, most of the active shares in the London market ran into new high ground for the current year at the beginning of September. The market was favorably impressed by the advances announced in American crude and gasoline prices, and talk of the possibility of a rise in petrol prices in Great Britain tended to concentrate attention on Anglo-Persians, Trinidad Leaseholds and the shares of other companies likely to benefit by higher selling prices for petroleum products in this country. Investment demands for Burmahs continued, and Mexican and Canadian Eagles were bought on the view that these companies' prospects were not adequately reflected in prices for their shares.

As often happens, the whole market turned irregular on fulfilment of the hopes on which buying had been based. Announcement of the actual date on which the U. S. Oil Code would be effective was followed by profit-taking in the London share market, and the Continent was also a seller on balance. As a result, some prices turned dull, the whole market hesitated, and activity was considerably reduced. Ready absorption of sales suggests, nevertheless, a good undertone, and there is no evidence of an over-extended speculative position. Conditions, therefore, seem ripe for a fresh upward price movement if the operation of the code in the United States brings the desired results. Many professional dealers believe that the prospective benefits of control in America have not yet been realized by British investors.

By its colorless reception of the definite announcement of the oil code details, the London Stock Exchange reflected the general attitude of British oil circles to the new development. Oil men in this country were never greatly impressed by the original price

London Stock Exchange Prices

1933 High	1933 Low	Last Year's Div. % per Ann.	Share	August 11 to September 10 First	High	Low	Last	Change
2 3/32	1 5/32	3½	Anglo-Ecuadorian	1 1/16	2 3/32	2 1/32	2 5/32	+ 3/32
1 5/16	1 7/16	10	Anglo-Egyptian "B"	1 7/16	1 9/16	1 7/16	1 9/16	+ 1/16
2 15/32	1¾	7½	Anglo-Persian	2 1/16	2 15/32	2 1/32	2⅜	+ 5/16
1 13/32	29/32	25	Apex Trinidad (5s.)	1¼	1 13/32	1 7/32	1 11/32	+ 3/32
2 3/32	1 1/32	....	Attock	2 1/32	2 1/32	1 9/32	5/8	− 1/32
5/8	½	7½	Brit. Borneo (6s.)	1 7/32	9/16	½	9/16	+ 1/32
¼	3/16	....	Brit. Burmah (8s.)	¼	¼	¼	¼	.....
5/16	5/32	....	Brit. Controlled ($5)	¼	9/32	¼	9/32	+ 1/32
1 1/16	1 3/32	....	Brit. Controlled Pfd. ($5)	1 9/32	1 1/16	9/16	5/8	+ 1/32
4 7/16	2¾	20	Burmah	4 1/32	4 7/16	3 31/32	4 9/32	+ ¼
1 5/32	¼	....	Canadian Eagle (No par)	1 1/32	1 5/32	1 1/32	1 5/32	+ 1/16
5/16	3/32	....	Kern River (10s.)	¼	5/16	¼	9/32	+ 1/32
2½	1½	12½	Lobitos	2¼	2½	2 5/32	2 13/32	+ 5/32
4 5/32	3 7/16	14‖	London & Thames Haven	4 1/32	4 1/32	4	4 1/32	.....
5/8	5/16	....	Mexican Eagle ($4 Mex.)	1 5/32	5/8	7/16	1 9/32	+ 1/16
2 1/32	3/4	2½	Phoenix	5/8	2 1/32	9/16	5/8	.....
23¾	15⅝	6	Royal Dutch (fl. 100)	21⅛	23¾	20½	22¾	+1⅝
2¾	1 29/32	7½*	Shell Transport	2 9/16	2¾	2½	2¾	+ 3/16
11¾	5⅞	....	Shell Union (No par)	9¾	10⅜	8¾	9⅞	+ ⅛
5/8	1 1/32	4	Steaua Romana	1 9/32	1 9/32	1 7/32	9/16	− 1/32
3 1/16	2 5/32	12½	Trinidad Leasehold	2 1/16	3 1/16	2¾	2 31/32	+ 9/32
5/16	3/16	....	Untd. Brit. of Trinidad (6s. 8d.).	¼	9/32	7/32	9/32	+ 1/32
2 3/16	1 1/32	12½	Venezuelan Oil Concessions	1¾	2 3/16	1 23/32	2 1/16	+ 3/16

Nominal value of shares £1 unless otherwise stated by bracketed figures.
* Denotes Tax-free dividend. ‖ 10 percent dividend tax free plus 4 percent bonus less tax.

Paris Bourse Prices

1932 Div.	1932 Par.	Share	August 8 to September 8 First	High	Low	Last	Change	Position on September 8, 1932
....	500 Lei	Astra Romana	76	86	76	86	+ 10	91
....	500 Lei	Colombia	..	70	64	70	..	81
10 Lei	500 Lei	Concordia	59	65	58	62	+ 3	59
....	500 Fr.	Franco Pol. Pétroles act	490	490	458	476	— 14	..
....	10$	Franco Wyoming	195	218	195	211	+ 16	221
....	500 Fr.	S. G. des Huiles de Pétrolé act	381	390	381	381	..	380
....	....	" " part	89	90	69	69	— 20	77
....	500 Fr.	C. Française des Pétroles	505	536	505	525	+ 20	460
....	....	C. Française de Raffinage	850	870	825	861	+ 11	..
....	....	C. Industrielle des Pétroles	..	335	315	335	..	322
45 Fr.	500 Fr.	Lille Bonni`res Colombes prio	825	833	790	825	..	700
20 Fr.	500 Fr.	" " ord	490	490	475	475	— 15	435
....	....	Malopolska act	15	16.25	13.50	13.50	— 1.50	26
....	....	Malopolska part	90	91	81	88	— 2	187
....	....	Mexican Eagle	42	53	42	53	+ 11	47
5 Fr.	250 Fr.	Omnium Inter. des Pétroles	70	74	67	74	+ 4	94
50 Fr.	500 Fr.	Pechelbronn	277	286	270	279	+ 2	375
45 Fr. B.	500 Fr. B.	Petrofina	433	437	428	428	— 5	467
5 Fl.	1000 Fl.	Royal Dutch	17,580	18,600	17,580	18,600	+1,020	17,750
5 Fl.	100 Fl.	Royal Dutch 1/10	1,763	1,859	1,763	1,859	+ 96	1,775
1/5 d.	1	Shell	218	232	216	230	+ 12	239
....	500 Fr.	Steaua Française	302	325	302	325	+ 23	243

fixing plan under the code, which was regarded as uneconomic in its earlier form. Fixing of a maximum output, and leaving prices to take care of themselves, is regarded as a great improvement. British distributors, who are naturally interested in the code as a major step towards righting the European selling position, point out that the maximum United States output fixed by Secretary Ickes is well in excess of the limit of 2,000,000 bbl. daily demanded by the Roumanian industry as the price of its adherence to world export control. It is hoped, nevertheless, that if the present restriction can be made effective, a great deal will have been done to bring world exports under control. As London sees it, the American oil code carries restrictive powers far in excess of anything previously possessed by any single authority in the United States. There is some doubt, however, as to whether all the requirements of the code can be fully enforced. This doubt is responsible for a disposition to await further results of restriction before basing action on it, either in the share market or the market for petroleum products.

CREDITORS and shareholders of Venezuelan Consolidated Oilfields, meeting under the compulsory liquidation, recently accepted an offer of £5,000 by Standard Oil Company of Venezuela for the liquidated company's principal interests. The assets concerned were the Orinoco Delta Concession, granted by the Venezuelan Government, and 99,500 shares in Siparia Trinidad Oilfields. Receiver for the Venezuelan Consolidated debenture holders already holds the Siparia shares as part security, and the official receiver stated that V.C.O. liabilities would swallow up the £5,000 received from Standard of Venezuela and that shareholders could expect no return. Standard of Venezuela, which is controlled by New Jersey Standard through Creole Petroleum Corporation, acquires the V.C.O. assets under conditions very favorable to a purchaser and, according to a statement at the meeting, will be able to join up its own areas with the purchased concession. In addition to its direct operations, Standard of Venezuela is working a concession for the British Controlled Oilfields, and is also testing areas in which Tocuyo Oilfields of Venezuela is interested.

OMISSION of an interim dividend on United British Oilfields of Trinidad eight percent preference shares caused no surprise in the market. Dealers had been prepared for the absence of a dividend by the chairman's statement at the last annual meeting. Official notification is given that results of trading for the half-year to June 30 show no improvement on those for the corresponding period of 1932. The company, which is managed by Anglo-Saxon, the big Royal Dutch-Shell subsidiary, announced better results for last year than in 1931, but has not yet paid a dividend on the eight percent cumulative preference capital, of which £350,000 was issued in February 1932.

ILLUSTRATING the financial strength of the leading British oil companies, a firm of specialists in oil shares has issued a summary of current liquid assets and liabilities shown in latest balance sheets, after making provision for final dividends. Following are some of the results arrived at:

Liquid Assets and Liabilities of Recent British Balance Sheets

	Liquid assets £	Surplus over current liabilities £
Anglo Equadorian	375,121	431,350
Anglo Egyptian	835,465	567,337
Anglo Persian	16,221,137	5,271,418
Burmah	10,506,702	8,404,197
Canadian Eagle	1,583,018	603,525
Lobitos	1,041,482	522,990
Mexican Eagle	6,249,975	4,823,575
Phoenix	354,371	83,632
Shell	17,478,298	15,260,442
Trinidad Leasehold	1,030,821	561,059
Venezuelan Oil Concessions	3,095,496	1,878,079

Many of the companies included in the list possess actual resources in excess of the figures shown in the accompanying summary. Burmah, for example, owns or controls £3,561,990 Anglo Persian ordinary stock and 1,000,000 Shell Transport ordinary shares. At around current quotations these interests, which are not included among the liquid resources, would give an additional value to the latter of over £10,000,000. Such large holdings could not, of course, be realized immediately without considerably depressing market values. Their possession is, nevertheless, a further buttress to the immensely strong cash position of the Burmah Company. There is no likelihood of the holdings ever coming on the market while Burmah retains its present position.

ALEC H. DAY

To Stockholders of
The Texas Corporation:

If you have not received circular letter dated September 11, 1933, recommending a special meeting of shareholders of The Texas Corporation, write for a copy of same to

B. E. EVANS, *Secretary*,
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